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**Back
in black**
Sikorsky's
Black Hawk
still in the fight

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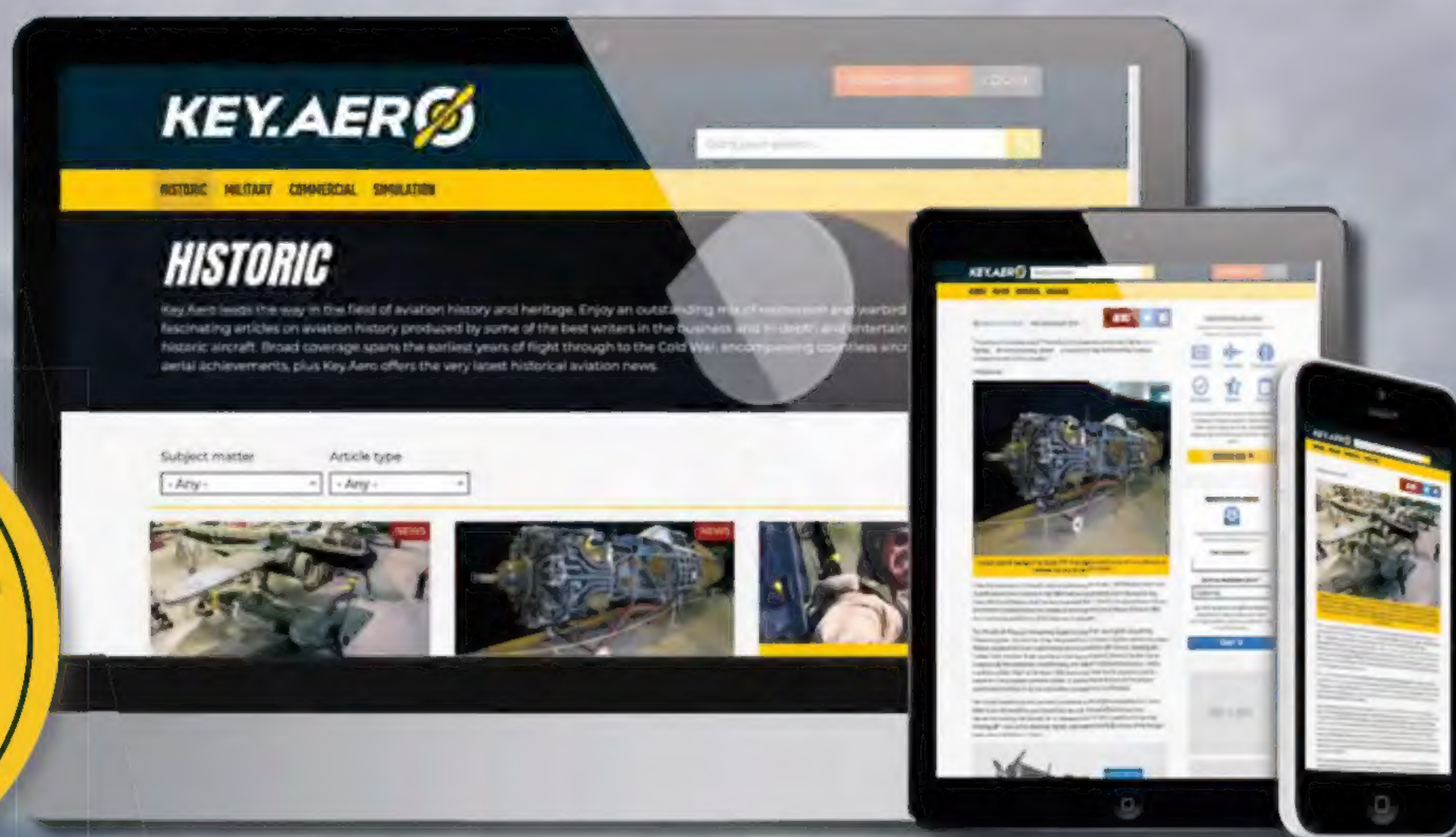
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Are things set to change regarding America's commitment to NATO and its support for Ukraine? Will President-elect Donald Trump try to solve the war in Ukraine by speaking directly with Russian President Vladimir Putin and reaching a possible deal without including Ukraine's President Volodymyr Zelenskyy?

There has been wide-ranging speculation concerning what may happen now that Trump has won a second term and many Western nations are bracing themselves for significant changes. Trump may well see his second term as a means to settle 'issues' he feels were

left unresolved, namely those focused against Iran and China, where the latter is regarded as an emerging threat. The US military is currently adjusting its operating doctrine in the region and equipping itself with aircraft and missiles that will have far greater operating ranges, possibly envisaging an island-hopping type of campaign similar to World War Two should conflict break out in the region.

Shortly after Trump's election victory, Volodymyr Zelenskyy described having an "excellent" call with Trump. "We agreed to maintain close dialogue and advance our co-operation," he posted on X. "Strong and unwavering US leadership is vital for the world and for a just peace." A US source confirmed: "Overall, Zelenskyy

greeted Trump and they had a very warm conversation."

The West now waits to see where the US will focus its military forces. Added to this is the need to introduce a sixth-generation fighter to the USAF and US Navy within fluctuating budgets. While Trump's campaign slogan of 'Make America Great Again' was at the core of his campaign, he will need to keep a keen eye on what is happening outside its borders during one of the most turbulent times has faced for decades.



Glenn Sands
Editor

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Will the US Department of Defense implement significant changes in policy following Donald Trump's re-election?

USAF Staff Sgt John Wright, DOD

FRONT COVER:

Competition to develop a sixth-generation fighter is seeing many designs being proposed. European nations are keen not to get left behind with their own programmes

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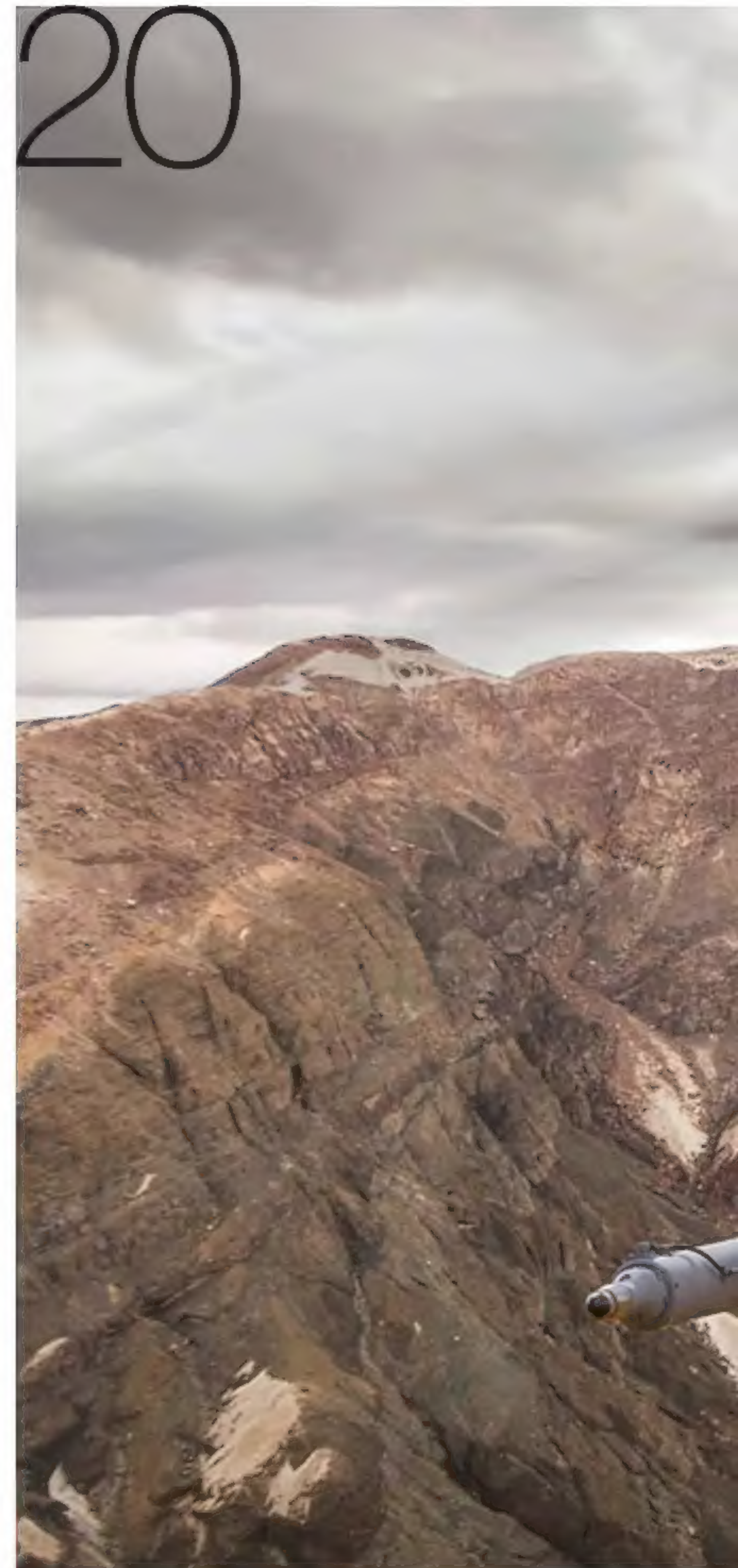
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It's been tested and cleared



for use, but less than 1% of aviation's requirements have been met. Michael Doran asks, "What's the hold up?"

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Countering China's Indo-



The need to 'reach out and touch someone' is a phrase that's mentioned informally by many US fighter pilots when discussing missile technology, and it appears for the US Navy, at least, there's the opportunity to extend that reach a bit further with the new AIM-174B, a variant of the long-range surface launched Raytheon SM-6, as known as the RIM-174 Standard Extended Range Active Missile (ERAM). Although the development of an air-launched derivative of the SM-6 had been know of, it was only in July 2024 that the first operational variants of the new

missile were seen on active-duty US Navy Super Hornets.

The introduction of the missile to the F/A-18 Super Hornet is regarded as a US counter to China's expansion within the Indo-Pacific region, affording the fighter the capability to strike inbound ballistic or cruise missiles, surface targets and enemy aircraft at estimated ranges beyond that currently available by a ship or ground launched SM-6, from which the AIM-174B evolved. Launching from an airborne platform means a scenario where a Super Hornet on station from the carrier battle group at 250 miles away, armed with AIM-174B, can combined, offer the

potential capability of attacking targets at a distance of more than 400 miles away from the main surface battle group, a tactic that the US Navy is keen to exploit in the contested regions within the Indo-Pacific, against China. The potential of being able to push back some of China's present threats against a US carrier battlegroup when operating in the region, such as H-6K bombers armed with cruise missiles, would mean their effective maximum launch distances would be beyond what's operationally achievable and risk exposing the H-6Ks to patrolling Super Hornets armed with AIM-174Bs, effectively negating this potential threat. The AIM-174B's speed

-Pacific *fighting doctrine*



of Mach 3.5 also means the air-launched variant will be able to intercept and destroy much of China's current anti-ship missile inventory including, potentially, the new range of air-launched hypersonic missiles now in service with the People's Liberation Army Air Force (PLAAF).

The long-range capabilities that the air-launched AIM-174B offers US Navy carrier-based aircraft may require China to shift the way that it operates moving forward, particularly when challenging US assets in the region. Due to the exceptional increase in strike capability and the rapidity that a suitably armed F/A-18 Super Hornet, equipped with AIM-174Bs, can get to the

particular area of threat, be on station, and is able to offer a similar first strike power potential threat, of an equivalently equipped Aegis Combat System as used on US Navy's *Ticonderoga*-class cruisers and *Arleigh Burke*-destroyers, and much delayed *Constellation*-class frigates, which may take several hours to get to the location of the threat. The AIM-174B will certainly give Beijing cause to decide how they deal with US Navy carrier battle groups in the future, when they are transiting the region – and how China's assets seeking to demonstrate a 'show of force' at these times and can remain 'out of touch' too. **AI**

The US Navy recently released its first official images of an F/A-18F Super Hornet armed with four AIM-174Bs, taken during the recent Gray Flag 2024 off southern California. The Super Hornet assigned to VX-9 is seen here with a US Navy F-35C Joint Strike Fighter and a USAF F-15E Strike Eagle

US Navy/Lt Cmdr Kory Hughes



CityAirbus NextGen eVTOL lifts off

The CityAirbus NextGen eVTOL prototype takes off for the first time at the start of a series of tests at the Airbus Donauwörth facility
Airbus

Airbus's goal of having a practical next-generation eVTOL has taken another step forward. On November 6, the OEM began remote pilot flight tests with a full-scale prototype of its CityAirBus NextGen eVTOL. The first take-off occurred at the company's new dedicated eVTOL Donauwörth facility, which opened in March.

Airbus Helicopters CEO Bruno Even announced the news of the first flight on social media: "I'm happy to share that the CityAirbus NextGen flight test campaign in Donauwörth, Germany, has started with a first lift-off. A big thank you to all our teams who have contributed to this important step in the marathon that is Advanced Air Mobility."

The four-seat CityAirbus aircraft is designed for flights of no more than 80km at a cruising speed of around 120km/h. Its maiden sortie followed a series of ground tests on the aircraft, which began

in December 2023 and consisted of testing electric motors and rotors. The Airbus engineering team also ran a series of in-depth analyses of the CityAirBus flight controls and avionics to prepare for its first take-off.

CityAirbus NextGen is a fixed-wing design and is configured with eight sets of propellers, two mounted on the leading edge of the wings, four across the trailing edge and two pusher-styles attached to the V-shaped tail boom. Compared to other platforms, it's a relatively complex design that has adopted the 'lift-and-cruise' layout.

Several operators have already expressed interest in the aircraft and signed memorandums of understanding with Airbus to assist in developing the programme. Among them are Avincis, a European helicopter operator, and aviation lessor LCI, which announced a collaborative strategy focused on strategies for advanced air mobility and commercialisation of the type. **AI**



Cometh *the* Caracal

The Dutch Ministry of Defence has awarded Airbus Helicopters a contract for 12 H225Ms, including an initial batch of support and services. Vice-Admiral Jan Willem Hartman, head of the Netherlands Command Materiel and IT (COMMIT) agency, and Bruno Even, CEO of Airbus Helicopters, signed the agreement during the Euronaval 2024 trade show in Paris.

Even said: "We are very proud to see the Royal Netherlands Air Force and COMMIT renewing their trust in Airbus Helicopters. The H225M was selected by the Netherlands in June 2023 after a call for tender and an exhaustive evaluation, after which the Airbus helicopter was considered the best option for the very demanding special forces operations. The proven H225M is unmatched in terms of performance, versatility and range. It can carry extensive mission equipment that can be tailored to each customer's needs and will be serving its customer's requirements for the decades to come," he added.

The Royal Netherlands Air Force (RNLAf) initially requested 14 aircraft, which was later reduced to 12 because insufficient funds were available for a fleet of that size with the aircraft modifications requested by the RNLAf.

Airbus published a statement that said: "Airbus Helicopters and the RNLAf will work closely together on the development

of the H225M adapted to the requirements of the RNLAf, enhancing capabilities and efficiency for special operations missions success, through tactical communication and a unique design of interaction of the aircraft and its systems."

Last month, the Dutch Ministry of Defence announced that a new unit, 300 Special Operations Squadron, based at Gilze-Rijen AB in the southern Netherlands, had been formally established to support the current rotary fleet. This includes the H215M Cougars currently in service, whose operational service will be extended until around 2030, when the H225Ms enter service.

The specialised variant requested by the RNLAf may delay delivery of the H225Ms until 2030 to 2032 due to demand for the model from several nations that have previously ordered it. The Netherlands is also expected to agree a number of related contracts associated with the H225M, including the Israeli Elbit self-protect system and combat radios from L3Harris.

Despite the reduction in number of aircraft, the Dutch Ministry of Defence has stated that the revised fleet size will allow for the support of one long-term special operations mission and potentially a second of slightly shorter duration.

The Korps Commandotroepen and the Maritime Special Operations Forces will use the Caracals to conduct a range of specialised missions, including reconnaissance, offensive support and military support. **AI**

The H225M has proven its reliability and durability in combat zones and crisis areas. The RNLAf will operate the type in support of Dutch Special Forces units at home and overseas

Airbus Helicopters

RAF joins Wedgetail partnership



The Royal Air Force took a significant step towards operating the Boeing E-7 Wedgetail on October 17, when the first E-7 Airborne Early Warning and Control (AEW&C) aircraft, WT001, rolled out from the Satys Aircraft Livery at Southend Airport in full RAF colours.

The unmarked aircraft had conducted its first flight from Birmingham Airport on September 20 in the hands of a Boeing flight test crew, who conducted functional checks. Following this flight, Stu Voboril, Boeing VP and E-7 programme manager, said: "This safe and systematic Functional Check Flight is an important step for Boeing and the RAF as part of our rigorous and extensive testing and evaluation. Our team is committed to ensuring the E-7 delivers the safety, quality and capabilities we've promised to our customer as we prepare for delivery of the UK's first E-7 Wedgetail to the RAF."

Group Captain Richard Osselton, RAF programme director for Wedgetail, added: "Achieving the first flight of Wedgetail is a significant milestone, representing an outstanding effort from the RAF programme team, DE&S, Boeing and STS Aviation. We will now build on this success and look forward to continuing the test and evaluation phase as part of our preparation for the aircraft to enter into service."

The pace at which the E-7 programme is progressing is noteworthy. In a little over four weeks, the RAF has shifted

from an unpainted flight test aircraft to a platform in full 8 Squadron colours, which it flew in on the same day it was rolled out at Southend. Sarah McDonnell, commander of 8 Squadron, stated: "Seeing the first UK Wedgetail, painted with a visual representation of 8 Squadron's history is an exciting moment in the journey towards operational capability for the squadron, RAF Lossiemouth and the RAF."

The RAF will eventually field a fleet of three E-7 AEW Mk1s, revised down from the anticipated five platforms initially requested by the MOD. The UK government has publicly stated that it has no plans to increase the number of AEW&C platforms for the RAF.

Despite the increase in technological

capabilities, three airframes are a significant reduction in AEW coverage from the RAF's previous fleet of seven E-3D AWACS. The final operational sortie flown by an RAF E-3D took place in 2021, with defence analysts being quick to point out that it left the UK without an effective AEW capability gap in the UK's defence for the next four years. This gap is set to close next year once the first UK Wedgetail completes trials before entering frontline service with 8 Squadron at RAF Lossiemouth.

Once the fleet is operational, the Wedgetails will form the UK's contribution to the NATO Airborne Early Warning & Control Force (NAEW&CF), headquartered at NATO Air Base (NAB) Geilenkirchen in Germany. **AI**

TOP: Wedgetail WT001 rolled out of the hangar at Southend Airport in the markings of 8 Squadron, which will operate the aircraft. Before the first flight in squadron colours, the RAF fin flash was quickly removed, having been painted in reverse on the tail

UK MOD Crown Copyright

THIS IMAGE: Prior to receiving RAF squadron colours, WT001 is one of three 737NGs being modified by STS Aviation Services in Birmingham

Boeing



Tilting towards Taiwan...



China recently confirmed rumours that it has been developing a large tiltrotor Osprey-like VTOL drone by releasing images of the prototype, the Lanying UR6000, at its production facility in south-eastern China. The six-ton drone, manufactured by United Aircraft, is said to be capable of carrying up to two tons and travelling at a maximum speed of 340mph (574km/h).

According to the released information, the vertical take-off and landing platform can carry up to ten passengers in both

ABOVE:

Once in operational service, the Lanying UR6000 would support logistics, SAR sorties, as well as ISR missions for the Chinese military

All Images via United Aircraft

BELOW:

The PLAN seeks to expand its reach across the Pacific, including operations from small island airstrips and a growing fleet of amphibious assault ships that would be ideal platforms for the UR6000

Specifications ■ United Aircraft UR6000

Length:	11.8m
Width:	5.3m
Height:	17.5m
Cruise Speed:	550km/h
Service ceiling:	7,620m
Maximum take-off weight:	6,100kg
Range:	1,500km
Payload:	2,000kg

manned and unmanned operations.

The Lanying UR6000 concept was initially unveiled at the Singapore Airshow in February, but the first operational prototype will debut at the 2024 Zhuhai Air Show in November. Some analysts have already compared this new Chinese UAV to the Bell Boeing V-22 Osprey due to its VTOL capability, despite its high operational weight. Reports from China have indicated that the platform is proving challenging to produce due to the high tolerance levels required in the airframe's construction.

United Aircraft has been keen to state that the drone's primary role is civilian cargo and passenger transport. Still, China's *Wuhu News* report indicated a broader role for the UR6000.

"The drone would strongly empower multiple fields in aviation, including emergency response and national defence," quoted *Wuhu News*.

Given United Aircraft's previous platforms and their use by China's military, the potential for the UR6000's adoption by the military is almost certainly guaranteed; as previously, United Aircraft's website indicated bids on Chinese military programmes since

late 2014. A recent company brochure quotes commitments to "military-civilian integration to strengthen the armed forces with technology."

With tensions between China and Taiwan increasing year on year, defence analysts indicate that a tiltrotor could be crucial for the People's Liberation Army Navy (PLAN), providing better airlift capability for troops, logistics and the ability to launch special forces-style raids from the carrier deck quicker than conventional helicopters – which may well prove decisive in the opening phases of a conflict in the Taiwan Strait, East or South China Seas. By introducing a tiltrotor capability, the strike capability of the PLAN's *Liaoning* and *Shandong* carriers is significantly increased, and many senior US military personnel in the region predict an island-hopping campaign could ensue if war should break out in the region. This belief is partly why the US Army is keen to introduce their FLRAA (Future Long-Range Assault Aircraft) into service in the next few years to increase the ability to deploy ground forces, similarly quickly and at a far greater distance than current US Army helicopters – it appears China is now thinking along those similar lines. **AI**



The classic come

Orders for a new Norwegian electric seaplane – and looking ahead to tap into a large potential market.
Mark Broadbent reports



back



In September 24, 2024 Nordic Seaplanes, a scheduled and charter carrier based in Copenhagen operating de Havilland Twin Otters, signed a memorandum of understanding to buy five Noemi all-electric amphibious aircraft from Eifly Group.

The agreement with Bergen, Norway-based Eifly, valued at around US\$150m, including an option for ten more Noemis, will see Nordic Seaplanes become the first airline to operate Noemi.

Under the deal, Nordic Seaplanes will work closely with Eifly, sharing their experience of water operations since

Eifly says the existing addressable market for new-generation seaplanes is worth US\$2.3bn
All images via Eifly Group



“We have a very successful operation with our Twin Otters, but we are excited to embrace a future into 2030”

Ole Christiansen, CEO, Nordic Seaplanes



“The common mistake [of] aviation start-ups is to say, ‘we need hundreds of engineers, really fast’”

Eric Lithun, group founder and CEO, Elfly



2016 flying the Twin Otter between Copenhagen and the city of Aarhus. The collaboration will also “explore new coastal markets beyond Scandinavia”, a statement said.

The agreement was announced by Nordic Seaplanes chairman and CEO Ole Christiansen and Elfly founder and CEO Eric Lithun during the Nordic Horizons event at Langelinie Pavilion in Copenhagen.

Christensen said: “We have a very successful operation with our Twin Otters, but we are excited to embrace a future into 2030 that is electric.

“With Elfly’s Noemi in a nine-seat configuration, we are making an investment in clean technology [and] sustainability, which will assure our business well into the future, not just for Denmark but as we look to expand into other coastal markets too.”

Lithun said: “Collaborating with this well-positioned European partner, with its wealth of experience here and overseas, makes a lot of sense. We can learn more from them about operating in a challenging environment, and together, we aim to tap seaplane markets beyond Scandinavia.”



CLOCKWISE FROM TOP LEFT:
Elfly intends to obtain an experimental Permit to Fly and fly the first Noemi test aircraft in 2027

Elfly has signed letters of intent with several states and municipalities in Scandinavia, which cover the development of zero-emission regional aviation

Noemi will be 16m in length, have a 21m wingspan and carry up to 1,000kg payload

Nordic Seaplanes has signed to buy five Noemis, with options for up to ten more



Classic traits

Noemi (the name stands for no emissions) is an all-electric, high-wing, twin-engine seaplane. Elfly announced the aircraft at the 2023 Paris Airshow. The company is developing it to existing European Union Aviation Safety Agency (EASA) CS-23 Level 3 certification rules.

According to provisional specifications provided to *Air International*, the aircraft’s dimensions are 16m length, 21m wingspan and 6m height. Noemi will have a 5,640kg maximum take-off weight and carry up to 1,000kg payload.

The take-off distance on water will be less than 1,000m, and the landing roll will be 850m. The aircraft will have a 108kts cruise speed. The engines will generate 950kW maximum power, and the batteries on board will provide 310kWh capacity. (Elfly notes that all data is subject to change.)

Lithun told *Air International*: “It’s very conservative in the design, it’s much like a Twin Otter. We’re trying to keep it in the low-weight segment and achieve 100nm range. That’s quite good for a seaplane.”

There are four different interior options for Noemi. The standard configuration (to which Nordic Seaplanes’ aircraft will be outfitted) is for nine passengers with luggage and ample legroom, providing what Elfly calls “comfortable, quiet rides, maximising operating and commercial efficiency”.

There is an executive layout for eight passengers and a configuration for special missions (such as medevac) to connect hard-to-reach locales with critical infrastructure. Finally, an all-cargo option will carry four standard-sized (230kg) cargo containers.

Elfly timeline

Elfly (pronounced ‘el-flee’) was founded

in 2018. Noemi is its third electric aircraft following the Equator, a small single-engine, two-seat amphibian (LN-EPX), and an electric racing aeroplane, the converted Cassutt III racer LN-EAP. The company’s staff travelled the world to learn from seaplane experts and investigate hallmark seaplane designs to develop Noemi.

Elfly’s engineering base is at Torp (Sanderfjord) Airport in southern Norway. The company has taken 1,160m² office and workshop space in the airport’s large hangar. Testing and validations will also be undertaken from the airport. Elfly currently employs around 30 people from 14 countries, with its employees bringing experience working for Airbus, Ampaire, Cobham, Collins, Embraer and Pilatus, among others.

Lithun emphasised: “The common mistake [of] aviation start-ups is to say, ‘we need hundreds of engineers, really fast’. We’re going to build slowly. I’d rather have people in the team that want us to achieve first flight and working on ➔

“Elfly says the existing addressable market for new-generation seaplanes is worth US\$2.3bn”



an electric seaplane than engineers that need a job.”

Lithun explained Elfly is taking a low-risk, building-block approach to developing Noemi: “We have tested 20% scale prototypes; we’re building a third 20% scale prototype now.

“We want to make an experimental prototype or concept vehicle first to test out the concept and not invest too much into a certification path in the beginning. The cost low and the speed high – that’s what we want to do.”

Elfly says that with Noemi designed to EASA CS-23 requirements, there is a “straightforward” certification path. The company applied to EASA in 2023 for a Design Organization Approval and Production Organization Approval.

The objective is to obtain an experimental Permit to Fly from EASA and fly the first Noemi test aircraft in 2027. A second test aircraft will follow in 2028 and a third in 2029. EASA-type certification is targeted for 2030, with US Federal Aviation Administration certification thereafter.

Battery power

The battery is crucial to an electric aircraft. Advanced energy storage solutions provider Electric Power Systems (EPS) was announced as the battery provider for Noemi during the July 2023 EAA AirVenture show at Oshkosh.

Under the terms of the agreement, EPS will deliver its EPiC battery line for the initial demonstration to incorporate upgradable energy solutions. EPS said its battery systems “have demonstrated unparalleled performance, safety and longevity, making them an ideal choice for Elfly’s research objectives”.

Lithun told *Air International*: “We’re trying to do this project with the lowest possible risk. I, as the main investor, want us to develop the programme with today’s battery pack – then you know that you’ll have a ‘positive risk’. My take is, if we design a plane with today’s battery pack, and it can do the mission and the business case, then it can expand from there.”

Regarding battery technology, Lithun noted: “You have different battery chemistries for different use-cases. You

have batteries that can do a tremendous amount of cycles; you have batteries that can do a tremendous output like the race plane we built.”

For Elfly, he said: “In a way, we are not that interested if they have pouch cell or cylinder cell inside the box, and if it’s lithium sulphur or lithium silicon or lithium-ion or whatever. If what we put in and what we get out is within the spec we have set, we’re happy.”

Seaplane market

Seaplanes provide connectivity between city centres and logistics hubs and make possible new airport-to-downtown city trips. The geography in Elfly’s home territory of Scandinavia is especially suitable for these aircraft.

Lithun cited Bergen-Stavanger in Norway as a good example of the potential seaplanes provide. Currently, around 550,000 passengers fly between these cities each year, but he says: “The airport at Bergen is a 20-25-minute drive from the city centre.

“If you travel by normal plane, you have to



go to the airport, go through security, wait for the gate, then fly for 20 minutes to Sola, [the airport at Stavanger], and then [it takes] 20-25 minutes to get downtown.”

It is only 162km from Bergen and Stavanger city centres, Lithun points out. A seaplane shuttle service with multiple daily flights between the harbours offers a better option, he says: “If we can send you from the city centre to the city centre directly you will do that in much less total time; it’s doable in 40 minutes [by seaplane].”

Launch customer Nordic Seaplanes already flies city-to-city services between Copenhagen and Aarhus harbours. It can take two-and-a-half to three-and-a-half hours to travel between these cities by a conventional flight, train or a combination of ferry/car. Flying direct takes 45 minutes.

Elfly has signed letters of intent with several states and municipalities in Scandinavia, which cover the development of zero-emission regional aviation, route networks and access to capacity.

Most recently, in July 2024, Elfly announced a partnership with the government of Gotland to introduce zero-

emission commercial seaplane flights to Sweden’s largest island, located 90km east of the mainland in the Baltic Sea.

Another agreement, announced in December 2023, is with Lofoten Green Islands, a private-public partnership for sustainable development in the Lofoten Archipelago in Arctic Norway. This will explore seaplane use for tourism and address Lofoten inhabitants’ transport needs.

Vidar Thom Benjaminsen, the Mayor of Vågan municipality and head of the Lofoten Regional Council, remarked: “Lofoten is a spectacular but demanding geographical area, where ground transport takes a long time.

“An electric aircraft capable of landing on water in a safe and good way, affordably priced, will be very good for Lofoten. We can travel from Svolvær to Reine in less than half an hour and make much better connections with larger regional centres.”

Future potential

Electric technologies open the way to lighter and more efficient aircraft, but

they provide a particular development challenge: maximising a battery’s energy storage and power output while minimising weight. More power means larger batteries, but obviously, this creates a weight penalty that restricts payload/range.

Technology advancements will likely improve battery storage/output over the long term, but currently electric flight is only truly viable (and cost-effective) for relatively short journeys. Smaller aircraft are not required to fly large payloads or long distances, so there is a lower technical threshold to integrate electric technologies.

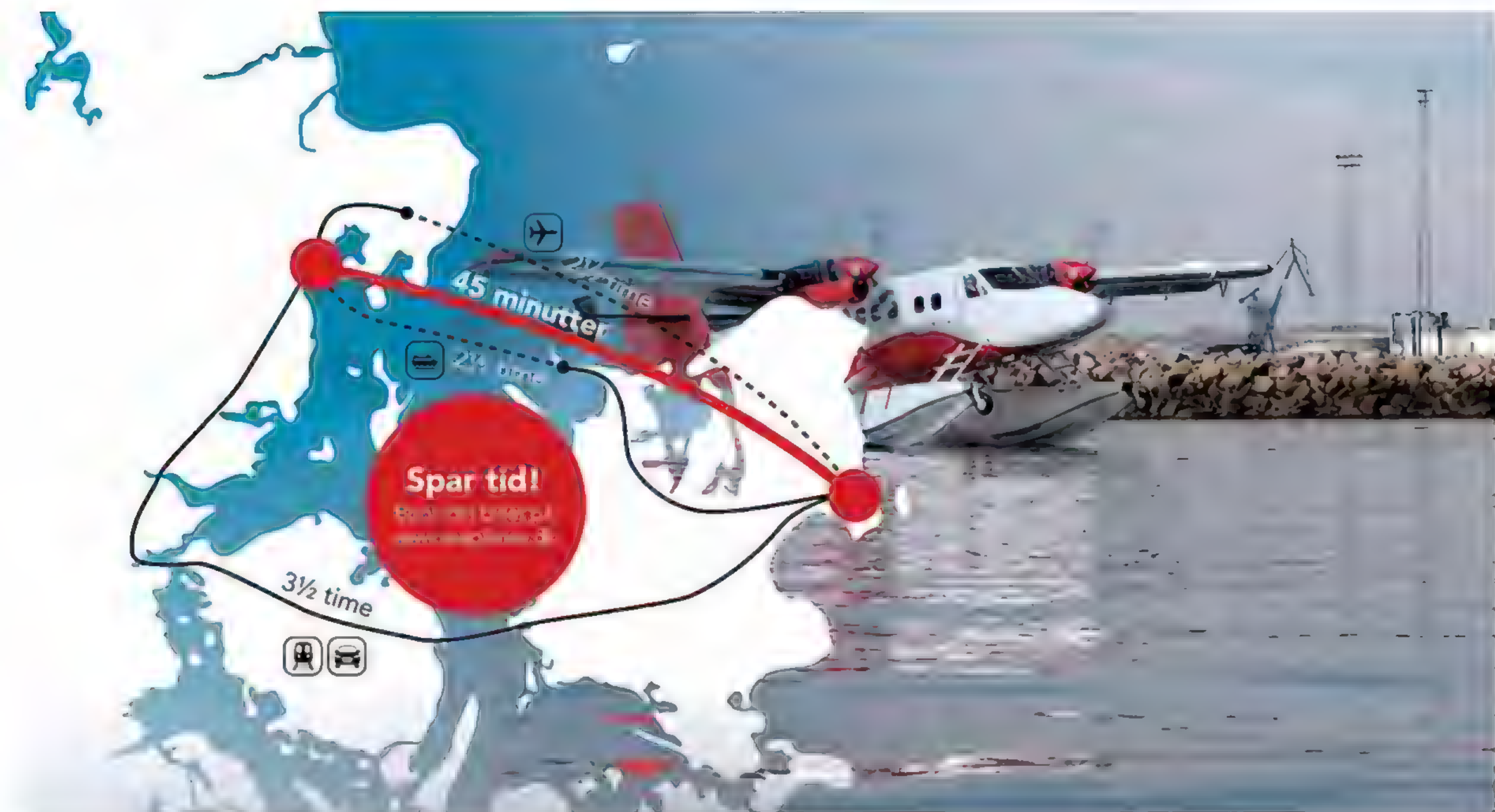
Lithun said of the seaplane market: “People who run seaplanes fly really, really short hops – 140km or something like that. There is almost nobody in the seaplane world that flies more than an hour.”

In this respect, commercial seaplanes are especially suitable for electrification. And with mandates to hit ‘net zero’ targets by mid-century looming in the background, Elfly sees Noemi as “an inevitable, high-potential solution” to replace ageing, high-maintenance seaplanes.

Elfly says the existing addressable market for new-generation seaplanes is worth US\$2.3bn, to replace aircraft currently used in Seattle-to-Vancouver, Maldives and New York City. Lithun says the Maldives is the biggest individual seaplane market: it is worth approximately US\$550m and transports well over a million passengers a year.

There are various other ‘airport-to-sea’ markets worldwide that seaplanes could serve, where these aircraft could integrate seamlessly with existing air traffic, such as Miami, Monaco, Dubai, Athens, Split- ➔

Nordic Seaplanes has signed a memorandum of understanding to purchase up to 15 Noemi seaplanes



Dubrovnik, Auckland and Jakarta.

The wider regional air mobility (RAM) market offers further potential. A May 2023 McKinsey report noted: “RAM brings together new aviation technologies and existing small airport infrastructure into a transportation model that is more equitable, more economical, and more environmentally friendly for air travel over short distances, compared to today's status quo.”

McKinsey said: “If these changes materialise, the total addressable market for small regional flights globally could be US\$75bn to US\$115bn by 2035, representing 300 to 700 million passengers annually.”

Next big thing

Elfly says Noemi's environmental performance compared to current seaplanes will remove approximately 8,300 tonnes of carbon dioxide emissions over the lifetime of each aircraft “while

unlocking immense economic potential and resilience in the communities it connects”. The company adds that replacing the current in-service seaplane fleet with Noemi would contribute 3.1 megatons of CO₂ savings by 2050.

Today, ESG (environmental, social, governance) criteria play a large role in capital market investment decisions (see *Air International* May 2024). The billions of dollars have shown the appeal of electric technologies to investors who have invested in the electric vertical take-off and landing (eVTOL) segment in recent years.

Lithun pointed out that, unlike eVTOLs, seaplanes are a reality right now. He said: “They have a fantasy market that doesn't exist. They think it's going to exist, but the seaplane industry is already an industry.

“Investing in a seaplane is a way you can [do] electric aviation today. [Noemi] can be certified within the rules and regulations of today – you don't need

to invent new certification rules. It's completely doable within the standards that already exist.”

He continued: “As an investor, my take is that you have an existing market and existing ways of certifying it and putting it into production, so it's lower risk. Nobody has done innovation in the seaplane industry for 40 years.”

Lithun said: “Seaplanes is a niche in many eyes, but we need to show that if you do some innovation in it, this will be the next big thing. It's a smart way to do the business case of an eVTOL within the laws of physics and the existing rules and regulations.

“You can have a higher payload when it's fixed wing. You don't need the disc and rotors. You can use the water for take-off and landing. It's safe and socially acceptable – people are used to activity on the water. We need to get investors to understand that the seaplane has huge potential.” **AI**

TOP:
The market: seaplanes provide a direct travel option in places like Denmark, where surface transportation can take a long time

NIGHT:
Nordic Seaplanes and Elfly announced their partnership during the Nordic Horizons event at Langelinie Pavilion, Copenhagen



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Black in Black

Glenn Sands spoke with Jay Macklin, director, Army Future Vertical Lift (FVL) and Innovations Business Development at Sikorsky, about what makes the UH-60 Black Hawk the world's prime air assault helicopter and what's going to make it even better



It already has an impressive operational career, has flown more than five million hours in combat and currently serves 36 nations, and that's set to rise. Wherever the US Army has been in combat, the skies over the battlefield have echoed to the beat of its rotors, and it has become the symbol

of America's air assault strategy. The Sikorsky UH-60 Black Hawk is anticipated to serve for a further 50 years, meaning the prospect of seeing Black Hawks on the ramp at any army base into the 2070s is pretty much guaranteed.

But what's making this platform the first, second and third choice for military

forces worldwide, who are continuing to order UH-60s and eagerly anticipating the upgrades now in development at Sikorsky?

Air International spoke with former US Army colonel and veteran Black Hawk pilot Jay Macklin, now director, Army FVL and Innovations Business Development at Sikorsky, on what keeps the Black





ABOVE:

Sikorsky received a \$6m award from DARPA to install ALIAS/MATRIX flight autonomy system onto the experimental fly-by-wire UH-60M Black Hawk. Designated MX, the upgrades aircraft will enable the US Army Combat Capabilities Development Command (DEVCOM) to test and evaluate a wide range of autonomy capabilities, from single pilot to fully uninhabited flight

All images via Sikorsky, a Lockheed Martin Company

PREVIOUS PAGES:

The US Army plans to deploy low-cost, lightweight Launched Effects (LE) drones in swarms to feed critical intelligence to joint forces. These highly capable drone have limited range and need a forward-deployed helicopter to launch and control them. Sikorsky has experience installing proven pylons and fire control systems on other Black Hawk variants, which could help speed the integration of LEs on the UH-60M

Hawk the platform of choice for air assaults and beyond.

Macklin explained: "With the public announcement by the US Army that the Black Hawk will be around until at least 2070, it has proven itself as a platform that's already had 40-plus years of service. In addition, we're coming up to 15 million flight hours in total for the current global fleet.

"The Black Hawk has proven itself. It was designed as a combat aircraft from day one and is incredibly reliable. It's tough, durable and very maintainable, with high operational readiness states. However, interoperability is now very

important, particularly for the partners and allies of foreign countries that have Black Hawks. I think all of these have contributed to its longevity and success the platform has had, with over 5,000 aircraft in service worldwide."

Macklin continued: "I think particularly with the US Army and the cancellation of FARA, there's going to be a combination of capabilities that will take over that reconnaissance mission – such as advanced UAS and different launched drone effects that the army will employ to do that reconnaissance mission. Moreover, the enduring fleet is well-positioned to pick up on some of that



MOSA

The US Army's Modular Open Systems Approach (MOSA) is part of the service's FVL programme and is to be the cornerstone approach for modernising the Army's helicopter fleet. With the concept initially applied to the FLRAA and FARA programmes, the 'digital backbone' concept is now being introduced to the UH-60M Black Hawk. MOSA will reduce the period for introducing new systems into the Black Hawk and remove out cycle time for future sustainability and improvements by shifting away from an 'OEM style lock' or proprietary. MOSA will offer the Black Hawk fleet a 'plug-and-play' environment where companies can offer the best technology for the UH-60 through competitive inclusion into the airframe, ensuring that they can be affordable, sustainable and be upgraded over the following decades. The potential of upgrading the aircraft 'in theatre' to counter a specific threat at the time has been openly discussed as a real possibility, simply due to the ease of rapidly introducing digital style upgrades to a helicopter fleet.

capability. The Black Hawk has got tremendous capability from the space in the cabin and the usable load, so lightweight launched effects have been successfully test-fired off the aircraft.

"The durability along with the ability of the Black Hawk to perform in a variety of roles and missions make it very well suited to be one of the enduring fleet aircraft that helps fill the role of reconnaissance on top of all the other missions that the platform already does, such as air assault, medevac, CASEVAC, search and rescue, logistical resupply and CSAR. In my opinion, that's what has contributed to the Black Hawk's success and durability."

Looking towards the future battle space, Sikorsky believes there are still many roles for the Black Hawk: "There's the standard support mission, which the Black Hawk does very well, but in the future, every weapon system out on the battlefield is a sensor, and I think we have seen that and painting that picture, that common operating picture for commanders, is going to be able to assist in this as an aerial mobility platform. There's potential for the Black Hawk to fill in on a portion of the reconnaissance role in the future, just like other enduring platforms will be doing.

"Looking at launched effects, they



simply don't have to be launched from aircraft. They can be launched from ground vehicles, so I think the Black Hawk will be one piece of the puzzle that will come together to help form the common operating picture for future ground commanders. When a Black Hawk can move to a certain portion of the battlefield and launch these effects and get out, it will provide that information, in real-time, back to the commanders. It's a very powerful capability, and on top of everything else it will continue to do, it makes it such a valuable workhorse for the US Army."

Air International asked Macklin to dive deeper into the potential of US Army Black Hawks undertaking the reconnaissance role using launched effects in the future. He said: "It's certainly a growing industry. Launched effects are being looked at by both the US Army and the government in terms of all the capabilities they may offer. There's certainly value in reconnaissance and sending real-time data back. Additionally, there are the traditional kinetic versions for offensive work and even electronic attack versions. Multiple types can be developed, and the US Army is looking at all options as a service."

"But achieving that overall picture for the ground commander is the priority with this capability. The Black Hawk cabin space already suits it well for these emerging tasks."

Macklin's comments make it clear the US Army will add additional roles to its warhorse. With a fleet that comprises 2,135 Black Hawks flying today, Macklin added: "With that number of aircraft, you have the potential to 'mass effect' this capability." For a potential adversary trying to counter wave after wave of launched effects released from Black Hawks, there is little they can do to counter such an attack.

Sikorsky has continually improved and upgraded the Black Hawk throughout its operational service, and this continues

today, the latest development being the UH-60M, which offers performance improvements and is much sought after by the US Army and allies for the battlefield environments of today. Macklin provided insight into the upgrades taking place: "The Black Hawk of tomorrow is going to be better than the Black Hawk of today, and the army has stated this during congressional hearings. We are extremely proud to be working on multi-year eleven for the Black Hawk, with the 'Mike' models that are being produced now, which are the latest versions. The durability, reliability and performance of the UH-60M speaks for itself, and I think countries worldwide, allies and partners are looking for that capability."

"This is not a commercial aircraft that was converted to military use. This was designed from the outset to serve the military from the beginning, and that's why we have seen the demand for the Black Hawk go up, and we are seeing significant numbers now. Australia, Greece and Austria are good examples of this; we are proud to provide them with the Mike model."

But we must consider modernisation and the improved turbine engine programme [ITEP], which will significantly increase the Black Hawk's capability on the battlefield. It's a more powerful and fuel-efficient engine. We think it will give the Black Hawk these different capabilities to increase its useful load, which is extremely important.

"With the ITEP we currently have installed in the Black Hawk at West Palm Beach, Florida [Sikorsky's Development Flight Center], we are undergoing integration testing right now with the ground runs due to be complete by the second quarter of 2025 and the first flight taking place in the same year. We're excited about the capability that this will bring to the Black Hawk, and we've been actively working with the army on integrating the engine into the platform."

"The other point in terms of



modernisation is modular open systems architecture, or MOSA; it's critical for the army to have this. They've made it a significant priority, and we understand that. It was part of the FVL, and MOSA was mandated to be part of this move towards the future.

"The modular open systems architecture approach allows customers to integrate capabilities on and off the aircraft, which will be extremely important. With the army prioritising this, it's definitely going to offer customers cost-savings. At present, they have to go all the way back to an OEM to get a certain component integrated into a platform. It takes a long time and is expensive, so



MOSA will help streamline and simplify the process, increasing the capabilities of the aircraft and improving maintenance sustainment.

"With this, what I refer to as a digital backbone, it will allow us to do things we really couldn't have done before. We have done a number of internally funded third-party open systems verification demonstrations, where we've given the architecture to a third party and they have integrated the different systems into our architecture without us. We gave them the technical package data and the architecture, and they were able to go in and complete the task. Things that took years in the past are now taking

weeks or just months. We are still trying to get through those savings, but they're significant well into the future." Macklin added: "We know the Black Hawk has to evolve, and we're making every effort to do that."

One of the most significant capabilities that will see the Black Hawk evolve well into the future is what Macklin refers to as 'the third leg of the stool' for the helicopter's future development – launched effects. Macklin said: "We know launched effects are going to be part of the future battlefield and we're continuing to look at how they can be brought to the Black Hawk. The platform will be great at moving these launched effects around ➡

ABOVE:

There is high international demand for the Sikorsky S-70 Black Hawk, manufactured by Lockheed Martin's PZL Mielec facility in Poland. More than 36 international customers operate the Black Hawk

FAR LEFT:

As the US Army looks to the future, it's confronting a complex set of missions and adversaries. In tomorrow's fight, it must be ready to operate over larger expanses of land and water, fight in an all-domain environment, and counter increasingly sophisticated threats; much like other operators, the Black Hawk may well take on a more offensive role with no FARA in service

the battlefield, so this is an area that I am excited about.

"For me, the three areas we are focusing on for the modernised Black Hawk are the improved turbine engine, open systems architecture and launched effects."

With the cancellation of the FARA programme, the technology developed for the RAIDER X will not be lost or put

to one side, according to Macklin: "The lessons we learned in terms of MOSA for FARA with the US Army, we have been able to take this to the Black Hawk when the programme was cancelled. We learnt how to integrate systems and how to bring capabilities on and off, in and out of the architecture easily. We had a head start on this when we started looking at the Black Hawk. I think that's a big lesson

we learned from FARA."

But according to Macklin, there's still more to come with the Black Hawk regarding autonomous flight. A recent demonstration by the company at AUSA 2024, in Washington DC, witnessed a Black Hawk being flown simply using an iPad link from within the convention centre to the aircraft located 300 miles away in Stratford, Connecticut. Macklin



added: "Autonomy was a big part of the army's FVL programme, and we think that autonomy is certainly something that has incredible value in the enduring fleet.

"With our MATRIX technology, we've got a UH-60A Black Hawk that we currently fly autonomously. We can also fly it in what I call 'an intelligent co-pilot' mode. You can simply fly the helicopter as you would a normal helicopter. Controlled

flight into terrain is something that that is a tragedy, and it happens every year; this technology can absolutely get rid of it."

He continued: "The new term the US Army is looking at is 'contested logistics', so is there an opportunity that maybe we can use the autonomy of the Black Hawk and move into some mission that was extremely dangerous, or long-range where we can utilise a pilotless Black

Hawk." But he was keen to point out that there's no one answer, adding: "Not every mission needs to be autonomous, and I think the US military is figuring out the applications for autonomy, but certainly having a system that allows you to right the aircraft if it gets into an attitude that's not safe, or it goes below a certain altitude, or towards an obstacle that the human pilot doesn't see; this is the



"We know launched effects are going to be part of the future battlefield and we're continuing to look at how they can be brought to the Black Hawk"

Jay Macklin, director, Army Future Vertical Lift and Innovations Business Development, Sikorsky

LEFT: The MX aircraft will be a near-exact copy of Sikorsky's UH-60A fly-by-wire Optionally Piloted Black Hawk helicopter, (illustrated), the company's flying lab that has tested MATRIX autonomy over hundreds of flight hours

When the US Army announced its major aviation restructure in early February 2024, which included cancelling the Future Attack Reconnaissance Aircraft (FARA) development, it detailed plans to award another multi-year contract for UH-60Ms using newly freed-up resources. The next US Army multi-year contract for Black Hawks will include up to 255 helicopters over five years, starting in 2027. Sikorsky's Black Hawk production line at Stratford, Connecticut, is set to busy well into 2032



technology that I think is very, very relevant as we increase the workload in the cockpit within particular launched effects.

"Autonomy is another tremendous opportunity that we [Sikorsky] think is going to be relevant moving forward, and we will continue to invest in this and demonstrate it to the army."

Air International asked Macklin if he views autonomous flight for the Black Hawk fleet as more than just an extra safety level for the aircrew and if there will be tactical advantages operationally in the future.

"Certainly, I wouldn't say if a mission was so dangerous we'd not want manned aircraft going out and we'd put unmanned aircraft out there, but there are certain cases where, say, it's an emergency resupply to a forward operating base, and it's really bad weather, and you know that the base is running out of ammunition. In combat now, the military will fly two aircraft, that's eight personnel that are out there flying that sortie. In the future, you could put one autonomous aircraft that could fly from A to B and back. You've just taken an extremely high-risk mission, but it has to go and remove the need for an aircrew. There are many missions like this out there.

"Do I believe that in the future, Black Hawks will approach a landing zone and, and as the troops board, they will look up and see there are no pilots? Probably not. However, that capability exists, and I think that the army challenges the industry all

the time to come up with and innovate new capabilities. I believe this is a new capability that the military will look at and figure out the best way to use.

"Immediately now, this capability will help pilots be better in the air as you increase their workload if you think about launched effects. With information coming into the cockpit, the pilot becomes a mission manager. With two pilots on the Black Hawk, one always has to be flying the aircraft; if you have MATRIX, this capability will help fly the aircraft, allowing you to be a better mission manager and a pilot – so there are opportunities out there."

The future of the Black Hawk is assured within the US Army, and although the army has talked about its FVL concept and about being further, faster and quicker in terms of its assets, at the core of all of this is the Black Hawk. Macklin explained why: "It goes to the role of the Black Hawk in an army division, and the role it plays as the workhorse is not really going to change before 2070. There'll be some aircraft that will do longer range type assaults, and indeed there's a place for that, but the day-to-day activity and support for ground commanders that do air assaults on combined arms operations to seize key terrain will be the job of the Black Hawks.

"Air movement, of personnel and equipment around the battlefield and logistical resupply, that goes on to the Black Hawk, for which it is very well

suited. Sling loading along with its internal capacity, particularly in the medical evacuation role, where we often talk of that 'golden hour' to get an injured soldier back to a level of care to sustain their life and ensure they survive, the Black Hawk has that capability. The Black Hawk is able to provide a capability from division commanders down to squad leaders that can shape certain operations.

"As we continue to modernise the Black Hawk and drive more capability into the aircraft through the Improved Turbine Engine, along with all the modifications on the open systems, what that's going to bring means for a commander, that if a threat changes or something in the battlespace changes, you know that they will be able to add a rapidly new capability that they can put onto the aircraft, versus something that is normally a cumbersome process."

He continued: "Launched effects, which are going to be present over a future battlefield, we are already working on, and the Black Hawk with little modification is well suited to this."

Perhaps the entire Black Hawk's influence on the military battlefield is best summed up by Macklin, himself a former Black Hawk pilot with numerous combat deployments during his career: "If the soldiers and aviators out on the battlefield didn't like what the Black Hawk could do, we wouldn't continue to make them, and that's something I am very excited about." **AI**

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*What's causing the **SAF** delay?*

Until new propulsion technologies are available, aviation can only reach net zero emissions by 2050 with sustainable aviation fuel (SAF). It's been tested and cleared for use, but less than 1% of aviation's requirements have been met.

Michael Doran asks, "What's the hold up?"



Aviation is an industry strictly governed by regulations that mandate what must happen for airlines and airports to operate. There is almost unanimous acceptance of reaching net zero emissions by 2050, but what is holding the industry back?

The United States Congress introduced laws in 1970 requiring a 90% reduction in emissions from new cars by 1975, and yet more than 50 years later, aviation has a set of aspirational targets but no firm

global regulations.

The US is offering financial support for producers to reach a sustainable aviation fuel (SAF) production target of three billion gallons per year by 2030, while the EU has enacted progressive blending rates in its ReFuel Aviation Directive, which mandates that all airlines use a 6% SAF blend for flights departing from EU airports by 2030.

Talking to the industry, it's clear that funding the transition to sustainable aviation fuel is problematic partly due to the need for certainty around mandates.

Investors don't like uncertainty and building a totally new supply chain will cost billions, with the government showing little appetite to provide capital.

In September, the International Air Transport Association (IATA) estimated that the airline industry will need to invest an average of \$128bn annually to reach net-zero emissions by 2050. That is significantly less than the estimated sum of solar and wind energy investments, which was \$280bn annually between 2004 and 2002.

IATA believes aviation's transition



Neste is the world's largest producer of sustainable aviation fuel and produces around one million tons annually in Singapore

Neste

is entirely feasible but only if all stakeholders, including governments, collaborate and act with greater urgency. The association said success would be facilitated by the government redirecting subsidies away from fossil fuels and towards renewable energy production, of which SAF is just one product type.

IATA's senior vice president of sustainability and chief economist, Marie Owens Thomsen, said the costs and challenges associated with the energy transition are large, but the opportunities are even more significant.

"To realise the opportunities, we need all minds to unite in this mission, and all policymakers, multilateral organisations, investors, solution providers and the air transport industry to work together," she said. "Such transformative collaboration can pool resources and target meaningful action for greater impact."

The global picture

In 2023, global SAF production reached 600 million litres, double that produced in 2022, but still a lowly 0.2% of the airline industry's fuel consumption. In 2024 around 1.9 billion litres of SAF will be produced, another significant leap but only about 0.5% of the total aviation fuel supply.

There is no question that SAF is a drop-in solution that can be delivered and used like-for-like with conventional jet fuel. The issues preventing its widespread adoption are availability and cost. Some airlines are now taking the initiative to address those issues rather than waiting for someone else to solve them.

Over the last few years, many airlines have flown flights using a blend of SAF and conventional jet fuel, and airports such as Singapore Changi, Seoul Incheon, London Heathrow, and Los Angeles International have proven that existing infrastructure will have no problems dispensing and storing

Through numerous trials, SAF has proven to be a reliable and safe drop-in replacement for conventional jet fuel
Neste

Matchmaking to grow SAF

At the World Sustainability Symposium in September, IATA announced it is launching the Sustainable Aviation Fuel Matchmaker to link airlines and SAF suppliers. The SAF Matchmaker will address three critical industry issues: connectivity, visibility, and efficiency.

IATA's Marie Owens Thomsen said the vision is to create a transparent, efficient, and accessible matchmaking platform that will accelerate the uptake of SAF by reducing the costs and complications that airlines face when looking for SAF suppliers.

"The SAF market's maturity and globalisation will be enhanced by the transparency that the SAF Matchmaker will enable," she said. "Every step in that direction is important, considering that SAF is air transportation's most significant decarbonisation tool."

The platform will enable SAF producers and suppliers to post available or planned SAF volumes, and airlines can register their interest in purchasing shown or desired SAF volumes. The actual trading will take place between the parties outside the platform.

It will carry comprehensive information on the SAF available, such as the feedstock used, the technology and location of production, the emissions reduction and the volumes available. SAF Matchmaker will also show compliance with the Carbon Offsetting Reduction Scheme for International Aviation (CORSIA) or the European Union's Renewable Energy Directive (EU RED).

IATA believes having a central platform will simplify SAF procurement and make connecting more straightforward and faster for all parties. The initial focus is on airlines and SAF suppliers, but governments and non-aviation corporate SAF buyers will eventually be able to participate.



renewable fuels.

The SAF supply chain is developing at different stages globally. For this feature, *Air International* is looking into two regions where progress is happening to highlight the varying approaches airlines and producers adopt in Asia-Pacific and the USA.

Punching above their weight

SAF development is accelerating in Asia-Pacific, where cutting emissions from long-haul flying is the most pressing issue. SAF is the only solution currently available to airlines like Qantas, Air New Zealand, and Fiji Airways to reach their emission reduction targets. However, small markets attracting investment need novel approaches.

What sets these airlines apart is their willingness to punch above their weight by seeking out energy industry partners to form collaborations and invest in developing local SAF production.

Fiji Airways has a fleet of just 14 jet aircraft and seven turboprops, including four Airbus A350s, four A330s, and six Boeing 737s. It is the oldest airline in the South Pacific and wants to be the leader in the development, production, and utilisation of SAF in the region.

In September, the airline announced a collaboration with the Fiji Sugar Corporation and Lee Enterprises Consulting to evaluate the feasibility of local SAF production using sugarcane-based feedstocks.

Sugar cane is a very productive crop in terms of biomass yields. Its high sugar content makes it particularly efficient for biofuel production, as sugars can be easily fermented into ethanol and upgraded to SAF.

Focusing on the wide-ranging benefits beyond just aviation, Fiji Airways chief legal and sustainability officer Peter Seares said this is a landmark project for Fiji and the South Pacific region.

"The feasibility assessment will lay a foundation for Fiji's national airline to meet its sustainability goals while utilising local resources that will help reinvigorate and transform the domestic sugar industry, create new jobs and improve the lives of Fijians."

Qantas is awaiting new ultra-long-range A350s in Australia that will operate nonstop flights from Sydney and Melbourne to London and New York. In 2019, Qantas joined the push for net zero emissions by 2050, and in 2022, it committed to using 10% of SAF in its fuel mix by 2030.

In July this year, Qantas joined an alliance including Airbus, Air France-KLM, and energy and financing companies to accelerate the global production of SAF. The alliance has committed \$200m to invest in SAF technology and development, focusing on repurposing existing infrastructure.

"IATA's Matchmaker will accelerate the uptake of SAF and that every step in that direction is of great importance"

Marie Owens Thomsen, senior vice president sustainability and chief economist, IATA



"A new emissions target is needed that better reflects the current challenges relating to new aircraft availability"

Greg Foran, CEO, Air New Zealand



"SAF is integral to the aviation industry's future, and a stable supply is critical to our ability to reduce emissions"

Kiri Hannifin, chief sustainability officer, Air New Zealand






Turboprops are ideal aircraft to operate on either SAF or to be leading the switch to Hybrid-Electric propulsion
ATR

In April, the fund invested in US company Crysalis Biosciences, which aims to renew chemical manufacturing infrastructure with innovative fuel and chemical production techniques. It has acquired and renovated an ethanol plant in the US that closed in 2019 but has now received approval to produce low-carbon-intensity SAF and biochemicals. Qantas has also invested in Australian

SAF projects, including Jet Zero Australia, which will use alcohol-to-jet technology to produce around 100 million litres of SAF annually. Qantas also commits to purchasing SAF from these projects to reduce financing risks and make them more appealing to investors. In 2023, Qantas renewed its SAF offtake agreement out of London Heathrow for a third year, delivering ten



“SAF produced from agricultural crops are generally higher, meaning that earning tax credits involves extra decarbonisation”

million litres of neat SAF during the year. This uptake (on a neat basis) represents 7.9% of the airline's total Heathrow fuel uptake and a reduction of 20,000 tonnes of CO₂ on a lifecycle basis.

Currently, Qantas uses SAF for just 0.2% of its total fuel consumption, although it said that it would climb to 3% over the next few years. That depends on SAF being available in the 'cost-

advantaged' ports Qantas flies to, which are primarily in the US.

Virgin Australia also targets net zero emissions by 2050 with an ambitious interim 22% reduction by 2030. The airline operates a fleet of around 90 Boeing 737s, including 737-700/800s and new generation MAX 8s, which operate on domestic and short-haul international routes.

One of those routes is from Australia to

Bali in Indonesia, where Virgin Australia (VA) fuelled its aircraft with SAF procured locally at Denpasar International Airport. On two days in September, VA used approximately 160 kilolitres of SAF supplied by PT Pertamina Patra Niaga for 737 services out of Bali.

Fiona Walmsley, general manager of sustainability at Virgin Australia, said SAF is a critical enabler for reducing the aviation sector's carbon emissions. She added that one of the most difficult hurdles for Australia to overcome is the availability of affordable SAF within the country.

“By working together on this initiative, Pertamina has helped bridge the gap for us, but ultimately, we need the support of many areas within the Australian and international aviation industry to ensure an ongoing, reliable and affordable SAF operation at Virgin Australia.”

Air New Zealand aims to be a leader in the quest for zero-emissions aviation. It is collaborating with multiple industry partners, including a project to replace its ageing fleet of 23 De Havilland Dash 8-Q300s with hybrid-electric aircraft for short-haul domestic routes.

In April 2024, the airline issued an Opportunity Statement to potential suppliers in the SAF industry, outlining its needs and inviting them to collaborate on supply opportunities. The airline anticipates that SAF will need to make up around 20% of its total fuel uptake to meet its 2030 emission reduction targets.


Air New Zealand's chief sustainability officer, Kiri Hannifin, said that SAF is integral to the aviation industry's future and that “a stable supply of SAF is critical to our ability to reduce carbon emissions and continue to play this role for the long term.”

“We have a mature understanding of SAF, a clear roadmap to meet our targets, and the volumes of SAF we need to align with current production capabilities. Our airline is known for pushing boundaries and challenging ourselves to think differently, and we're also deeply committed to meeting our decarbonisation goals.”

In April, the airline signed an agreement to purchase nine million litres of neat Neste MY Sustainable Aviation Fuel. The SAF will be produced at Neste's Singapore refinery, blended with conventional jet fuel, and supplied to Los Angeles International Airport between April and November 2024.

In July, Air New Zealand became the first major airline to abandon ambitious emission reduction targets by 2030, reasoning that many of the levers needed to meet the target were outside its control.

CEO Greg Foran said that work had commenced to consider a new, near-term emissions reduction target that better reflected the challenges of new aircraft deliveries and alternative jet fuel availability.

“It is possible the airline may need to retain its existing fleet for longer than 

planned due to global manufacturing and supply chain issues that could potentially slow the introduction of newer, more fuel-efficient aircraft into the fleet,” he added.

Airlines in Asia are not standing still, and many operate commercial flights with SAF blended fuel. However, the cost and availability of the renewable alternative mean the uptake is relatively insignificant.

One example is Korean Air, which announced in August that it is using domestically produced SAF for the first time on flights from Seoul to Tokyo. The first flight operated from Seoul Incheon Airport on August 30, making Korean Air the first to operate commercial flights with locally produced SAF.

Once a week, the flight will use a 1% SAF blend to serve as a starting point



ABOVE RIGHT:
Emirates flew a Boeing 777 with one engine powered by 100% SAF produced by Neste
Emirates

BOTTOM:
Fiji Airways is studying the use of locally grown sugar cane waste as a feedstock for SAF production
Fiji Airways

soybeans and corn. Using agricultural feedstocks and existing infrastructure results in SAF projects in the US being large undertakings, meaning that the US has the potential to become the world’s largest SAF producer.

The downside is that compared to waste feedstocks like cooking oil or animal fat, emissions from SAF produced from agricultural crops are generally higher, meaning that earning tax credits involves extra decarbonisation and efficiency offset measures.

In September, Delta Air Lines flight DL2732 from Minneapolis to New York was the first flight fuelled partly by SAF from Minneapolis-St Paul International Airport. It was also the first-ever commercial flight in North America with SAF made from camelina feedstock.

This SAF is made from the winter camelina plant, which produces an oil-rich seed that can be crushed, refined, and used to produce sustainable aviation fuel. Camelina’s advantage is that it has one of the lowest carbon intensity scores of the many feedstocks being used for SAF production.

Also in September, a BP refinery in the US announced it is preparing to produce SAF from biomass feedstocks, including crops grown for fuel, with compost, municipal waste and other by-products, such as beef

tallow, soybean oil and used cooking oil.

The project received a \$27m grant from the Federal Aviation Administration’s (FAA) sustainable aviation fuel initiative. BP is using the funding to build infrastructure and equipment to make SAF for the first time.

The refinery is estimated to produce ten million gallons of “green jet fuel” every year. This fuel will be supplied to airports across the US Northwest via the Olympic Pipeline, which supplies fuel to Seattle Tacoma International Airport in Washington.

The world’s largest commercial SAF supplier, Neste, provides up to one million gallons (3,000 metric tons) of Neste MY Sustainable Aviation Fuel to United Airlines for use at Chicago O’Hare International Airport.

Starting in August, the SAF is being supplied to the airport via pipeline from Neste’s newly commissioned SAF terminal in Houston, Texas. United will be the first airline to purchase SAF for operational use on flights from Chicago O’Hare, one of the busiest airports in the US.

Neste’s SAF is produced using 100% renewable waste and residue raw materials, such as used cooking oil and animal fat waste. It can currently be blended up to 50% with conventional jet fuel before use and works seamlessly with existing aircraft engines and fuelling infrastructure. **AI**

for the airline’s domestic SAF program, followed by medium – and long-haul routes. Two Korean energy companies – S-Oil and SK Energy – are supplying the SAF, each with a six-month supply period.

S-Oil produces SAF from used cooking oil SK Energy uses a combination of used cooking oil and animal fats in its SAF production process. Korean Air has implemented SAF since 2017, when it was first used on a flight from Chicago to Seoul.

Agricultural approach in the US

In the United States, SAF production is expected to be predominantly based on agricultural feedstock, which includes



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Optimistic

for Europe's communities' connectors

Bernie Baldwin reports from the ERA General Assembly on the state of regional aviation in Europe and its challenges as the industry continues to deliver important connections


"Regional connectivity is vital. Just see and hear the reaction locally when services are reduced or are in jeopardy, or simply stop." So declared Jesper Rungholm, president of the European Regions Airline Association (ERA), as he introduced the open conference sessions of the Association's 2024 General Assembly in Seville.

Although that comment masked a subtle warning to Europe's regional aviation community, the ERA itself is increasing its strength. The membership has grown to 230 industry companies, including 55 airlines. "This year alone, we have seen 25 companies join our diverse association, supporting the vital work of ERA," Rungholm reported.

The following sessions examined the challenges facing regional carriers if they are to continue their vital role, such as sustainability, cost uncertainties, geopolitical tensions, supply chain issues, new technology and skills shortages.

Rungholm, CEO of Danish Air Transport (DAT), addressed the last of these, declaring it "a subject close to my heart" as he is also a pilot with more than 45 years of experience. His concern over personnel shortfalls involves a personal element.

"I have just turned 65 and I'm no longer allowed to fly commercially. I have my rating and I have my medical, but no. What a waste of experience and labour!" he exclaimed. "It's not only my fate; it's the same every year for hundreds of pilots all over Europe. The reason is that the EU and EASA have imposed an age limit of 65, a policy I believe to be both discriminatory and arbitrary and which lacks a clear and factual basis.

"There are more than nine countries with no such age limit. EASA says it is difficult to obtain data from these countries. But if a significant safety risk had emerged due to pilots over 65, such data would surely be available. If elderly pilots in these nine countries were causing incidents and accidents above their fair share, it would be noticed," Rungholm emphasised. "I questioned several aeromedical examiners, and the answer is that pilots nearing 65 do not present a significantly higher risk of failing medical evaluations compared to younger pilots. The current age restriction is outdated. 

OPPOSITE TOP: *Luxair CEO, Gilles Feith (2nd right), makes a point during a panel session, watched by (l-r) moderator Andrew Kelly, director, corporate affairs, ASL Airlines Ireland; Jóhanna á Bergi, CEO, Atlantic Airways; Luke Farajallah, CEO, Loganair; Mikael Wångdahl, VP airline operations, SAS Group; and David Curmi, executive chairman, KM Malta Airlines* All images by Bernie Baldwin unless stated

OPPOSITE BOTTOM: *There was no chance of missing where the ERA General Assembly was being held within the Seville Congress Centre* ERA

Outlook



THIS PAGE FROM TOP:

Mikael Wångdahl, VP airline operations, SAS Group (right) believes that better long-term solutions must be found to secure the pipelines of young people entering the regional aviation sector

ERA

Alfredo Morales, CEO, Binter (left) accepts the ERA Airline of the Year award from Alexis Vidal, SVP commercial and CCO of ATR, which sponsored the awards

ERA

Watched by Meiltje de Groot, CEO, Groningen Airport Eelde (left), Jasmin Bajić, president and CEO, Croatia Airlines, reported his company's sustainability strategy to meet global climate change goals

ERA



"Also, we should remember that professionals in other clinical fields, such as a surgeon, a cruise ship captain or a bus driver are allowed to work into their 70s or 80s, provided their performance remains completely unimpaired. Age alone should not be a determining factor.

"Those involved in the day-to-day operations of airlines know the tools that allow early detection, intervention and intervention of any performance issue. At DAT, we recently had to remove a captain from operation based on the safety management system. This demonstrates that the system works, so now is the time to change," Rungholm concluded. ERA will, of course, be campaigning for that change.

Tapping into new technology

The panel discussion on the other aforementioned topics kicked off with each panellist highlighting their biggest concerns.

For Jóhanna á Bergi, CEO of Atlantic Airways, the reliability of new technology engines and the supply of spares, including full engines, are causes for concern. CFM LEAP engines power the airline's two A320neos. "That has been our major issue in recent months – and it's having a huge impact on the industry.

"The second issue for Atlantic Airways is competitiveness. We serve the Faroe Islands

ERA Award Winners 2024

ERA Airline of the Year – **Binter**

ERA Sustainable Airline Award – **Loganair**

ERA Innovation Airline Award – **SKY express**

ERA Regional Connectivity Airline Award – **Binter**

ERA Personal Excellence Award – **Sean Gates, CEO & Founder at Gates Aviation**



"Safety, quality service and constant innovation stand as our priority values and delivering the best travel experience to our customer is our main goal"

Alfredo Morales,
CEO, Binter



all year round – a small niche market – but we don't have economies of scale. And it's tough to see other airlines coming in and cherry picking during the high season," á Bergi added, while also admitting to being challenged on recruiting competent skills.

Loganair CEO Luke Farajallah noted that it is "a massive issue" for his airline. "We're the largest regional in the UK, but the draw of money is all-compelling to some groups, particularly the pilots. We've seen a very large movement of the pilots," he remarked.

"It's always the case with regional airlines that they'll feed the larger airlines. But in the last two to three years, within the pilot workforce the pay has risen exponentially fast. It's outgrown just about every other cost of our business. Holding on to good pilots is no longer just a financial transaction proposition. The younger generation doesn't want just that; they want a lifestyle relationship with their company as well. It's the same for engineers and cabin crews."

Like many airlines, Loganair is troubled by supply chain issues. "For us, it is frustrating to have no visibility or confidence as to when those problems will end. Therefore, there's

no place for optimism and there's no place for hope. The only thing we can do is plan," Farajallah explained. That puts you in quite a pessimistic frame of mind because you have to plan the worst-case scenario, which is very often the realistic scenario.

"We've found ourselves in a position where we've flown a little less, but we've had to do so because we've internalised the challenges rather than relying on the supply chain. We've relied on our own means to solve our own problems," he continued. "That's become normal, and I suspect when the supply chain bounces back, it'll take a long time for us to internalise that again because we're getting into how to solve our own problems."

Mikael Wångdahl is VP airline operations at SAS Group and oversees the company's regional flying carried out by carriers such as CityJet, Xfly, SAS Link and SAS Connect. On personnel matters, he believes that, nowadays, young people entering aviation don't necessarily do so to stay in the business. "They go into it to see if it can be an industry that is interesting for a few years before doing something else. Also,

during Covid, there were a lot of retirements at the same time, so it's also changed industry. Together, we must find better ways of securing the pipelines long term," he declared.

Also making life awkward for Wångdahl and his team is the security clearance of staff and the associated background checks. "That, of course, is a very important part of making sure that we don't have people with criminal backgrounds getting into sensitive parts of businesses like aviation. But at the same time, we face a situation where there is no collaboration between the different countries' police forces. They don't share the criminal records, so staff actually have to apply for each country, making it hard for people to move around. Some kind of organisation on this matter between the countries within the EU would be very beneficial for all."

Gilles Feith, CEO of Luxair, agreed with Wångdahl, recalling an occasion when staff with Luxembourg passes were needed in Vienna due to an aircraft on the ground (AOG). "My people, who hold a dozen airport badges and have full background

New ideas for the media

If anything illustrated the changing times in regional aviation, it was the list of press conferences, with everyone being presented by a company creating aircraft and engines using alternative power sources and none of the more traditional OEMs.

Zero-Avia CEO Val Miftakhov explained the company's decision to opt for hydrogen-to-electric power. The company already has all the required technologies in-house at its UK and US sites, and more than 30 patents have already been granted.

The ZA600 is a Pratt & Whitney PT6 replacement, targeting initially the Cessna Caravan and the Dornier 228. "We've been flying a ZA600-powered Do228 since January 2023," Miftakhov reported. "We're now working on the second Do228 airframe and aim to fly the aircraft in the first half of 2025. We also aim to fly our first Caravan early next year, with a view to certification in 1H26.

"The ZA2000 is for 40-80 seat aircraft and is a PW100 Series replacement with 2-6MW shaft power. We have a Dash 8-400 test aircraft in partnership with Alaska Airlines and De Havilland Canada and plan flight tests in 2026 with entry-into-service (EIS) in 2028," he added. "That will be followed by the ZA2000RJ designed specifically for CRJ700 but also for CRJ900/1000s. That needs 10MW per side so that it will be available around 2030."

Ascendence is bringing two products to market, the Atea aircraft and the Sterna hybrid-electric power train, according to Vincent Joséphine, the company's sales and marketing lead. "Aviation has set ambitious net zero goals, so decarbonising is needed now, and we believe only hybrid technologies will do this on a larger scale.

Atea is a four-passenger (plus luggage) VTOL aircraft with EIS planned for 2028. "It already has more than 600 pre-orders. We're assembling the first Atea for a first flight in 2025," said Joséphine. Meanwhile, the Sterna engine already has Daher and Delair as partners in the programme.



Vaeridion brought a cabin mock-up of its Microliner to Seville
Vaeridion

Vaeridion's Microliner, according to VP commercial Taco Stouten, will deliver zero-emission flights by 2030. "It's a low-weight aircraft, even with two pilots, with a range of 400nm while carrying nine passengers. Wing-integrated batteries keep the wings down like turboprops on narrowbody aircraft and make the overall structure lighter," he explained.

The Microliner is a dual-engine aircraft driving a single propeller. "The

two engines do not 'recognise' each other, so if one fails, the other carries on," Stouten noted, addressing safety concerns. Its first flight is expected in 2027, with EIS in early 2029.

"About 80% of regional flights in Europe are under 500km and need about 800m of runway. The Microliner can replace many of the aircraft currently flying those routes," the VP commented.

Aura Aero's president, Jérémy Caussade, reported that a pre-application contract was signed with EASA in April 2024, meaning that its 19-seat ERA (Electric Regional Aircraft) is ready to go through its certification programme. More than 600 Letters of Intent (LOIs) have already been signed. ERA's first flight is scheduled for late 2026, with EIS in 2028.

Construction of a factory in Toulouse is underway, and it is set to open in late 2025/early 2026. "It was one of the last sites available there with access to the runway," Caussade noted. The company will also have a facility in the US at Daytona Beach.

Elysian is aiming for a much larger aircraft. Its fully electric E9X is designed to fly up to 90 passengers up to 800km. According to Bastiaan de Bruijne, director of government and industry affairs, the aircraft's wing will also incorporate batteries and have folding wingtips.

"We will deliver zero emissions by 2033 EIS with the E9X and believe second-generation batteries are likely to offer a 1,000km range," de Bruijne added.

checks, could not enter Vienna Airport [to assist with the AOG]. This is absurd. Europe exists in some places, but in other places – where we need the same badge – it doesn't exist. We need to improve this situation," he stressed.

Regulation is another concern for Feith. "Whenever it's EC at the beginning, for example the new guidelines for tankering, everything is made for the average person, the average airline, the average everything," he commented. "But regional airlines are different. We don't have an armada of lawyers and lobbyists, so that measures don't get absurd." Feith warned that, at first glance, the new tankering rules "will penalise regional airlines heavily".

KM Malta Airlines is the new carrier for the island, aiming to pick up and improve on the now-defunct Air Malta. The airline's executive chairman, David Curmi, remarked that the company had "started from a blank page on a robust business plan. We're already seeing that some assumptions need to be revised".

The challenges are familiar. "Costs are creeping up, eating into razor thin margins. We have no PSO routes (and none qualified), and we only operate to major airports. The



THIS PAGE FROM BOTTOM:

The Welcome Reception provided a valuable networking platform as delegates made new acquaintances and renewed old ones

Lunchtime in the exhibition area enabled many opportunities for discussions and deals

ERA

ERA welcomed approximately 500 delegates to this year's General Assembly

ERA



costs over which we have no control are going up at those airports," Curmi said.

The airline is not spared at its home base either. "Sustainable aviation fuel [SAF] costs, including transfer of fuel to the aircraft, at Malta have gone up and made it the most expensive in Europe," he noted glumly.

Recently receiving its eighth A320neo and removing its last A320ceo should have been an advantage for KM Malta. "But we have been hit by unexpected costs, such as our new LEAP engines. We don't have a back-up aircraft, and there are no ACMI airlines in Malta. We've had to buy more spare engines and even lease some. We've had eight engines affected. For a small airline, that's difficult," Curmi stated.

Potential of sustainability

The second open panel session focused on sustainability and the challenges of delivering the targets set for 2030 and 2050. The debate covered decarbonisation efforts, milestones achieved, economic and investment barriers, and the regulatory landscape.

Meitje de Groot, CEO of Groningen Airport Eelde, one of the five biggest airports in the Netherlands, began the discussion. "We serve our community particularly with mainly leisure flights. What's important is to be included in the region, such as working for the hospital in the neighbourhood, for which we deliver transport flights—a really important task," she noted.

"We are also the site of the KLM flight training school. One of the problems in aviation is the shortage of airline pilots, so this school is going to deliver a lot more pilots in the coming years. We are also developing the airport campus with a combination of other learning communities, like those which develop MRO students and ATC operators.

"We really focus on sustainability," de Groot continued. "We have the space to develop an ecosystem for sustainable options like hydrogen. We work with a lot of companies in the region, including bigger energy companies like Engie, Shell, and RWE. Fokker NextGen will build an assembly line here and will be producing aircraft by 2035."

Jasmin Bajic, president and CEO of Croatia Airlines, believes the industry needs to engage passengers on pollution. "It is created because of their demand, as they like to travel. We have to talk with them because every one of us has a responsibility towards the environment," he remarked. "With Croatia Airlines, we are strongly committed towards environmental protection. That aligns with global climate change goals based on the four pillars of investing in technology, working on optimal regulation of air traffic and improvement of aviation infrastructure, increasing operational efficiency, and implementing adequate economic measures.

"Croatia Airlines' new Airbus A220 fleet will be more environmentally friendly, significantly reducing fuel consumption and CO² emissions. We are seeing such results on every route we are flying compared with the previous technology," he reported.

"SAF is a challenge for Europe and globally, given that production capacities and feedstocks are limited. Another problem facing airlines is the additional documentation relating to SAF. For example, different directives from different regulatory bodies mean having to verify the same data on energy twice, which is causing unnecessary costs and wasting resources," Bajic said.

Marylin Bastin, acting director of European Green Sky, Eurocontrol, highlighted that regional aviation is where disruptive technologies such as electric, hybrid and hydrogen-powered aircraft are most likely to be pioneered and that her organisation's role is to support this. However, she pointed out a serious anomaly that needs to be addressed.

"The way that route charges to airlines are computed now depends on the weight of the aircraft. But with electric and hybrid powered aircraft carrying heavy batteries, they will have to pay more. That makes no sense because we are supposed to help those new technologies enter the market," Bastin explained. "So, we are working with our member states (because it's not Eurocontrol that can decide the charges) to increase awareness of this and to try to find solutions."

Bastin believes there are still many technological barriers to overcome with SAF. She expects half of the SAF production to be synthetic, as there isn't sufficient feedstock for all of it to be biofuel-derived.

Summing up the event, ERA's director general, Montserrat Barriga, remarked, "This year's General Assembly marked another pivotal moment in the Association's ongoing mission to advocate for the vital role of regional aviation in connecting Europe's communities and economies. The resilience and forward-thinking nature of the regional aviation sector is impressive. As one speaker said, there is great optimism for our sector because we serve communities, and that will never change." **AI**



"The resilience and forward-thinking nature of the regional aviation sector is impressive"

Montserrat Barriga,
director general, ERA



"Construction of our factory in Toulouse is under way and we will also have a facility in the US at Daytona Beach, Florida"

Jérémy Caussade,
president, Aura Aero



"The EU and EASA have imposed an age limit [for pilots] of 65, a policy I believe to be both discriminatory and arbitrary and which lacks a clear and factual basis"

Jesper Rungholm,
president ERA and CEO, Danish
Air Transport



Thinking big, being bold



Cebu Pacific is one of Asia's tiger airlines, with passenger numbers forecasted to reach a record 24 million this year, **Michael Doran** went to the Philippines to ask CEO Mike Szucs what drives the airline



The A320neo aircraft have a much lower noise footprint and produce carbon emission reductions of up to 20% compared to older jets
All images via Cebu Pacific



In pre-pandemic 2019, Filipino regional airline Cebu Pacific carried 22.5 million passengers, but number for the following three years combined was just 23.3 million, bouncing back to 20.87 million in 2023. Despite having up to 15 of its best-performing aircraft grounded due to engine issues, the airline expects to handle around 24 million customers this year.

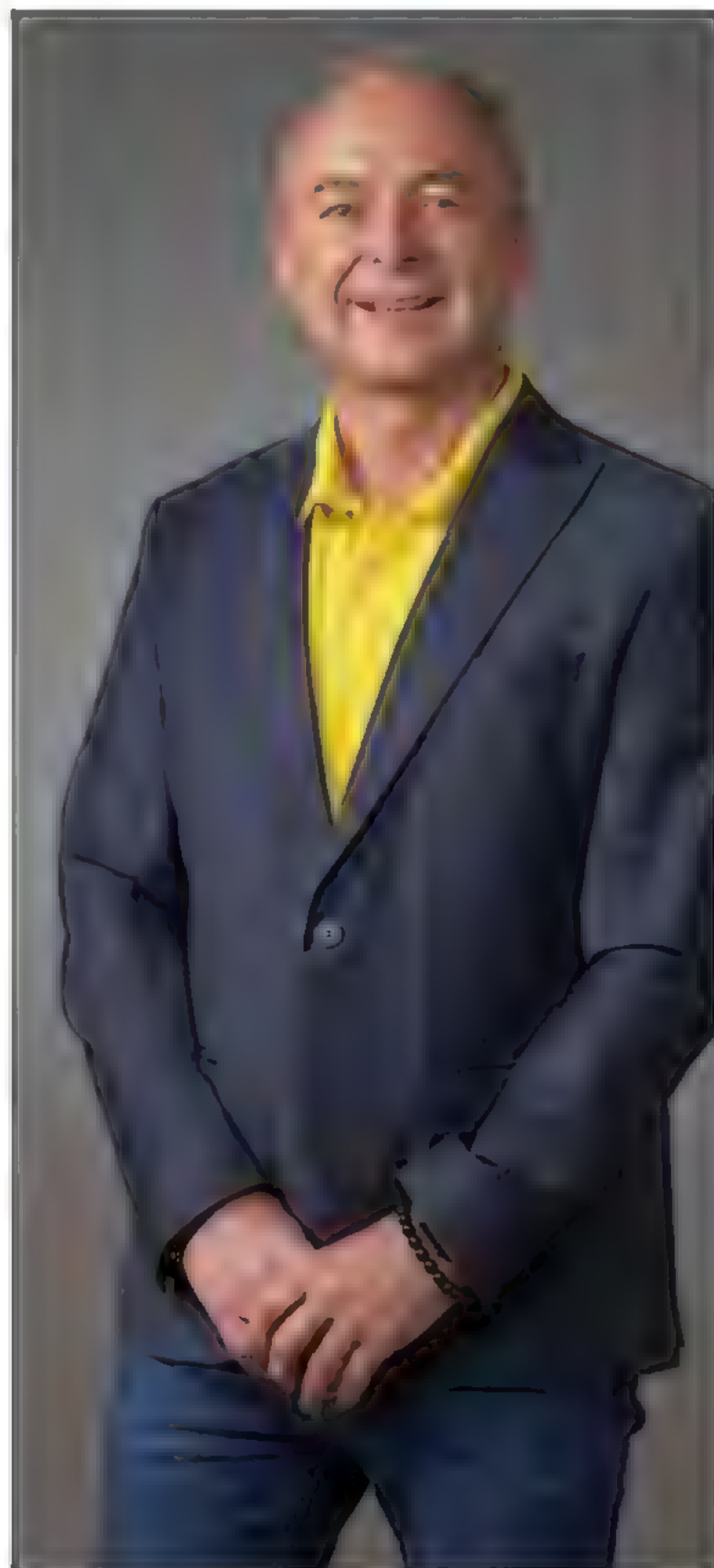
The low-cost carrier has returned

capacity beyond pre-pandemic levels, and with new Airbus A320neo Family aircraft arriving on a regular basis, it is opening domestic and international routes, with plans for new operating hubs in Davao and Iloilo in the Philippines announced recently.

In October, Cebu Pacific CEO Mike Szucs signed off on a firm order for up to 102 Airbus A321neos, with options for an additional 50 included in the agreement.

“We’re going through a growth burst at the minute, and we’ll see quite substantial growth in Q4 of this year”

Mike Szucs,
CEO, Cebu Pacific



The airline is also awaiting delivery of 22 additional aircraft from previous orders, which will arrive over the coming months.

During the October 2024 Philippines Aviation Summit in Manila, *Air International* sat down with Mike Szucs to learn more about this strong growth and the largest aircraft order in the Philippines’ history, valued at \$24 billion at list prices. He discussed his overarching business philosophy of keeping strategy simple and consistently executing well.

Staying focused on what you’re good at

After spending some time with Szucs, it’s clear that Cebu Pacific is sharply focused on its importance to the Philippines and the opportunities that exist within that market. While there are many things the airline could be doing, the scale of opportunities open to it serving the Filipino market will keep it busy for years to come. Szucs said: “What I am sure of is the huge opportunity that exists here in the Philippines. We have a young, increasingly educated and wealthy population of around 115 million that lives in an archipelago, and the growth potential just on the domestic market alone is phenomenal. So our principal objective is to protect and grow that home market

“I describe it as two concentric circles, with the first one being a small radius that just captures the Philippines because it’s such a great market in terms of the potential that’s there, so do that bit right. The second circle is around four hours of flying, which is a perfect short-haul distance for an LCC, and in that circle, there are two billion people within four hours of flying time of Manila.

“This is our tried and tested formula: we’ve got a magnificent opportunity in our home market and a fantastic addressable market within four hours of flying. So let’s not distract ourselves too much from looking at those basic fundamentals of being a super-efficient, safe, on time, reliable, great customer service and very affordable bus in the sky – that’s how we see ourselves.”

Many of those people are in emerging markets around Southeast Asia, where the Cebu model is perfectly aligned with the market, and the customers want what the airline is offering. For those who want business class with a lie-flat bed or a full-service airline there are many other options, but Szucs describes that as “not our gig.”

While the guiding principles are clear, there are three popular routes operated by Cebu that are outliers: the long-haul services between Manila and Dubai and Sydney and Melbourne. Generally, long-haul low-cost carriers need help to survive with the often conflicting demands. While some can

A pipeline of Airbus aircraft for the future



Cebu Pacific has placed the largest aircraft order in the history of the Philippines.

In July, Cebu Pacific signed an agreement with Airbus to purchase up to 152 A320neo Family aircraft, doubling the airline's fleet by the end of 2023. On October 3, 2024, Cebu Pacific (Cebu) officially signed a firm order for up to 102 Airbus A321neos, plus purchase rights for a further 50 A320neo Family jets. The deal is the largest in the history of Philippine aviation, with a value of \$24bn based on the list prices for the entire 152 aircraft order. Despite the current durability issues with the Pratt & Whitney GTF, Cebu has stayed loyal to the engine, which is performing superbly when on-wing.

Cebu CEO Mike Szucs said the selection of Airbus and Pratt & Whitney (P&W) underscored the airline's focus on operational efficiency, sustainability and innovation. It ensured Cebu continued to deliver the highest standards of service while significantly reducing its carbon footprint. He said: "This milestone signals our ongoing dedication to expanding air transport accessibility and affordability while supporting the Philippines' broader economic growth and connectivity goals. The biggest thing we can do today for sustainability is invest in new aircraft, and

we still have 22 more new planes coming in over the next three to four years compared to previous orders."

By the end of this year, Cebu expects to have grown its fleet to 95 aircraft, including ten Airbus A330neo widebodies and 15 ATR 72 turboprops. At the signing ceremony, Benoit de Saint-Exupery, executive VP of sales of commercial aircraft business at Airbus, said the latest order demonstrates the growing opportunities of aviation in the Philippines and the larger Asia Pacific region: "The A320 Family has supported Cebu Pacific's domestic and short-haul international network growth over the last two decades. We're confident that these additional A321neo will contribute strongly to the all-Airbus operator's next phase of expansion as one of Asia Pacific's leading low-cost carriers."

In October, the Cebu Pacific fleet stood at 90 aircraft, including 20 Airbus A320-200s, 22 A320neos, seven A321-200s, 16 A321neos, nine A330-900neos, and 16 ATR 72 turboprops. The fleet's average age is just 5.7 years, skewed by the older generation A320-200s, whose average age is 11.2 years.

do it successfully, many have tried and failed. Szucs said: "As we found out from our experience, some routes work and some don't. Dubai works because it is so thick it's good for everybody, and we've worked out that Australia works because there are a lot of Filipinos there. We've also got a product that's perfect for Australian backpackers who want to come to the Philippines for a beach holiday. It's very, very simple."

Decades ago, there was a business theory of 'sticking to the knitting' and, as an experienced aviation professional, Szucs has seen many ways to operate an airline come and go. His sharp focus and understanding of what Cebu offers and how that suits its home and international markets set him apart from the many airline leaders who add new routes or aircraft with little chance of success.

Szucs says that Cebu needs to be opportunistic question what is the value from a growth and financial point of view: "Some say we should fly to the west coast of the U.S like PAL [Philippines Airlines], but that doesn't fit the Cebu model. I think when you look at a particular opportunity in the market and you understand the rest of the dynamics, it increases your focus. It's a sensible way to keep the business alive."

The engine problem

Like almost all users of the Pratt & Whitney geared turbofan (GTF) engine, Cebu has had significant numbers of Airbus A320neo Family aircraft grounded with engines awaiting inspection or repair. Cebu and Pratt & Whitney (P&W) have reached a compensation settlement, and the engine maker provides other support to mitigate the operational impact.

However, even with that support, the issue will linger at Cebu for at least another one or two years. The number of aircraft expected to be grounded has reduced due to a change in the inspection and remediation process. Eight aircraft are currently out of commission, but that number will reduce slightly by the end of 2024 as a number of GTF engines are entering the workshop for an

LEFT:

In October, the Cebu Pacific fleet stood at 90 aircraft, which included 65 Airbus A320 Family, nine A330-900neos and 16 ATR 72 turboprops

OPPOSITE TOP:

The Cebu Pacific A330neos are configured in a single class layout of 459 seats



inspection to determine the extent of the durability issue.

The GTF performs exceptionally well and is producing double-digit reductions in fuel consumption and carbon emissions, but it needs to come off the wing earlier than expected. Szucs expects the issue will be resolved but noted that the airline has had to carry stand-by capability and manage more variability and uncertainty to account for the engine issues: "We went through a lot of pain a year ago, and we've increased our stand-by capability to capture that. Once a week, we review the outlook for the next six months in terms of availability, and we have to make sure that we're making adjustments to what we've got on sale. It's a burden, but one we've got used to."

Cebu expects to have more aircraft in operation by the end of the year than anticipated, which has created another, albeit happier, issue for the airline to solve. It has more capacity than planned and Cebu is the only carrier in the Philippines to have fully recovered to pre-pandemic levels, which means it is finding more growth: "That's good because we're the only ones who can grow. The market's there but we're accelerating growth

probably more so than we would have done. So, we're going through a growth burst at the minute, and we'll see quite substantial growth in Q4 of this year."

As more aircraft were forecast to be grounded, Cebu brought in some additional aircraft on short-term leases and procured spare engines, but now the balance has shifted. It has more capacity than expected for the rest of the year. To use that capacity, it is bringing forward the opening of the new bases in Davao and Iloilo, which will start operating this year.

Supply chain issues

With aviation approaching full post-pandemic recovery, it might be surprising to learn that airlines, original equipment manufacturers, maintenance operators and airports are still significantly hampered by supply chain disruptions. The ongoing impact of those disruptions is prolonging engine issues, primarily due to parts and materials shortages. Szucs explained: "When the engine comes off wing, it doesn't go into the shop because they haven't got the parts available to do the changes that are required, and that's further down the supply chain with their Level Two or Level Three suppliers.

There's nothing wrong with the engine or the materials per se, but they can't get the parts, and that's affecting everyone. We're still anticipating we will get delivery delays, because whether it's Airbus, Boeing or any manufacturer, they are continuing to face these problems. They are doing what they can, but it's just taking a long time for it to come back."

To help alleviate some of this uncertainty, Cebu is making sure it is carrying a larger inventory of spares, both in terms of the type of parts it stocks and the numbers on hand. It is anticipating supply chain disruptions for some time and expects lead times to worsen before they get better: "When people were ramping up immediately after COVID, we worked hard to stay ahead of the curve. So in that critical front line – whether its pilots, cabin crew, ground handlers, etc – we've invested extensively in terms of making sure we've got a pipeline and training people. The one thing that's more difficult now than at any time in over 30 years is that the level of uncertainty and variability we have to live with is off the scale."

Unexpected changes and disruptions are part and parcel of running an airline,



and Szucs has successfully dealt with many throughout his career. Most airlines have stopped forecasting profit guidance due to this uncertainty, but when asked about the challenges he might face in coming years, he quickly settled on one: "I think it's execution. We're investing a lot in the technologies and processes to make sure we can manage the significant growth that's coming, but execution is a risk. We have a lot of people who are very capable of doing that, so it's up to us to go and execute the plan. We will have some hiccups along the way, but if we do that well, then we should be good."

A few days after this interview, on October 7, 2024, it was confirmed that Cebu Pacific had acquired AirSWIFT, a local turboprop operator with a fleet of two ATR 42-600s and three ATR 72-600s. AirSWIFT is a boutique airline that caters to the domestic travel market from Manila's Ninoy Aquino International Airport (MNL) and Angeles Clark International Airport to El Nido, a world-renowned tourist destination in northern Palawan. It also flies from El Nido to holiday hotspots in Cebu, Caticlan, Busuanga and Panglao.

Cebu does not operate to El Nido and will use AirSWIFT, which will not change its schedules or services, to break into one of the Philippines' most popular holiday destinations, the island of Palawan. It's likely Cebu will eventually add El Nido to its routes, freeing up aircraft and widening its network, which is already the largest in the Philippines, with 35 domestic routes and 26 international cities.

Before the pandemic in 2019, AirSWIFT made £22.4m in revenue and, as domestic travel recovered, AirSWIFT flew a record 355,458 passengers in 2023, well ahead of its pre-pandemic high of 321,523 in 2019. In a statement to the local stock exchange, Cebu said the price it agreed with the airline was arrived at after arm's length negotiations on a willing-buyer, willing-seller basis and took into account, among other things, the net asset value and financial performance of AirSWIFT. The £23.4m consideration comprises outstanding shares and shareholder advances and will be made as a one-time cash payment. Cebu will place the funds in escrow, which will be released only after all post-closing obligations and adjustments are met. **AI**

The high-capacity Airbus A330neos are ideal for budget travellers who want to travel on the latest generation widebody





In develop and in trouble



ment

Much focus has been placed on the US NGAD sixth-generation fighter and the Anglo-Italian-Japanese GCAP programmes. However, other less familiar projects are underway globally, although the Franco-German-Spanish FCAS system seems in trouble. **Jon Lake** reports



ABOVE & RIGHT:
Dassault's original NGF concept was notably a small and radical design, tailless, packed with LO features, and sized to be carrier compatible. Six years later, the NGWS partners still use CGIs and illustrations of different NGF configurations!
Dassault

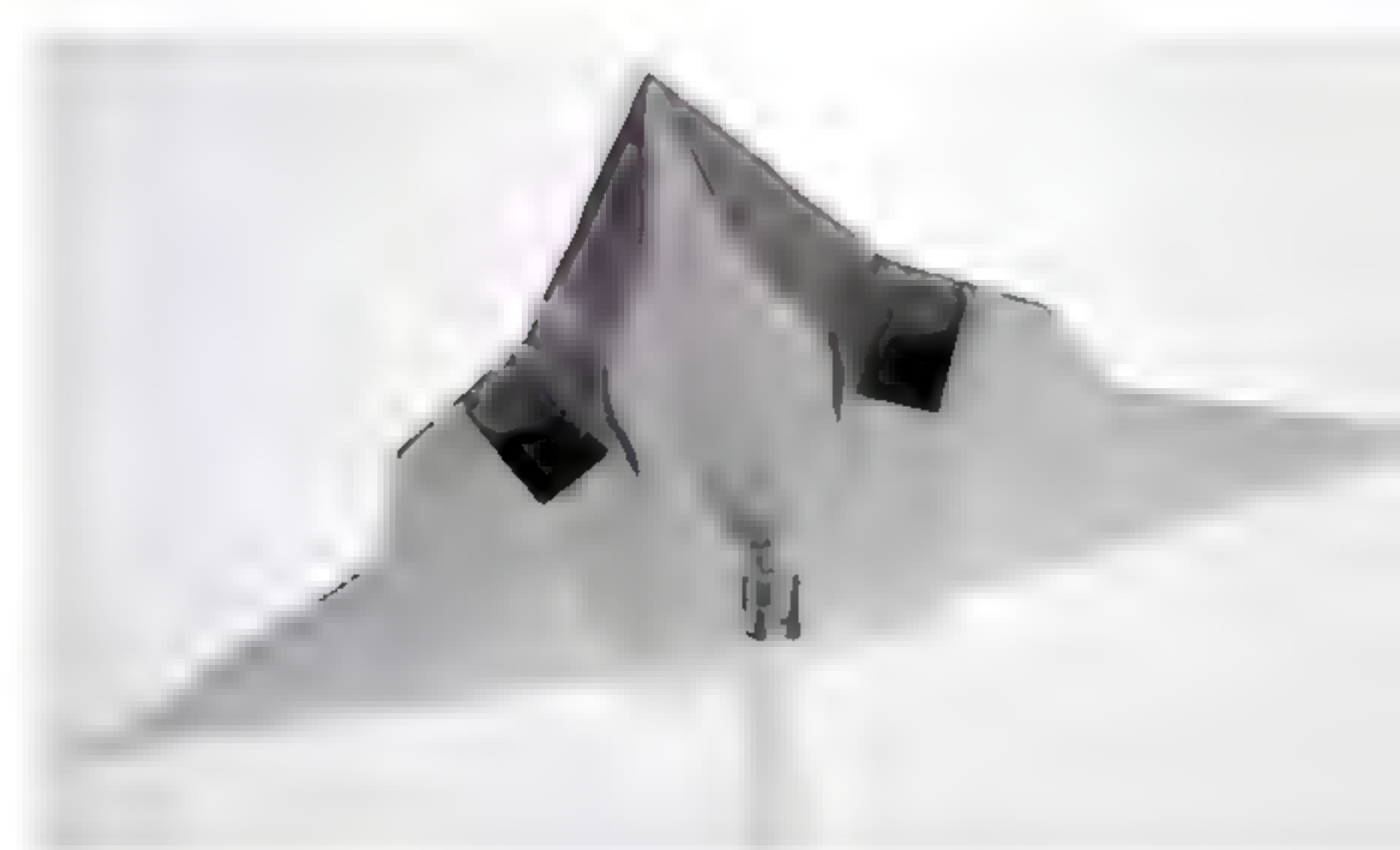
OPPOSITE:
Dassault's later NGF concept, seen here flanked by a Rafale and a Falcon 10X cabin mock-up, remains a relatively small aircraft – significantly smaller than Airbus' version of NGF, much smaller than the US NGAD is likely to be, and dwarfed by the rival Anglo-Italian-Japanese GCAP concept
Dassault

PREVIOUS PAGES:
Recoverable remote carriers surround the Airbus NGF concept. The Airbus concept is larger than those shown by Dassault, better optimised for long-range and larger payloads
Airbus

While the US NGAD fighter jet programme faces severe funding difficulties and might be scaled back dramatically, this doesn't indicate that the requirement for it has 'gone away'. New and evolving threats and an increasingly contested airspace will require new air power, as even fifth-generation aircraft will be inadequate.

This is why sixth-generation air dominance families of systems are under development. The Anglo-Italian-Japanese GCAP programme has been frequently discussed in *Air International*, but there are other less familiar programmes underway globally. In Europe, there's the Franco-German-Spanish Future Combat Air System (FCAS) programme, while Turkey is moving ahead with its Kaan and Sweden is defining its future fighter programme.

France and Germany ought to have





been a match made in heaven when it comes to developing Europe's next-generation combat air platform. Close allies with similar requirements, they are the leading aerospace nations in the European Union and both have a long and proud heritage of developing fighter aircraft and collaborating on advanced international aerospace programmes.

Quite apart from Airbus's airliner family, France and Germany were the major partners in the Transporter Allianz, a consortium of MBB, Aerospatiale and VFW-Fokker responsible for the C-160 Transall transport aircraft. They also jointly designed and produced the Alpha Jet, a design submitted by a team comprising Breguet Aviation, Dassault Aviation and Dornier Flugzeugwerke. Though the original concept was a merger of the Breguet 126 and Dornier P.375, the Alpha Jet integrated design team was set up at Saint-Cloud in February 1971, with Dassault designated the 'pilot' company

for the project with final authority on design and management decisions. However, Dassault's involvement was, to a great extent, the result of the company's 1971 takeover of Breguet, which had started with Dassault's acquisition of 66% of Breguet Aviation on June 27, 1967.

While Aerospatiale and Breguet have proved successful collaborators, cynics would say that the Alpha Jet was Dassault's only successful collaborative programme, following as it did the failure of the Anglo-French VG (AFVG) project undertaken by them and BAC. Marcel Dassault had felt that taking a subordinate position to BAC on the AFVG would threaten his long-term objective to become Europe's premier combat aircraft producer and he ensured that it was abandoned. Since then, Dassault's expectation that it should have design leadership in collaborative programmes de-railed the company's planned participation in the multi-national

Eurofighter (then the Future European Fighter Aircraft programme) and has limited further collaborations, at least when it comes to manned combat air platforms. Dassault's expectation that it will 'lead' has subsequently been the cause of much of the turbulence affecting the new FCAS programme.

Background

Work on the FCAS concept started in 2001 as part of the co-operative European Technology Acquisition Programme (ETAP) established by Germany, France, Great Britain, Italy, Sweden and Spain. This was intended to be a system of systems that included manned combat aircraft and unmanned aircraft, which was judged to be more effective in the future scenarios than manned systems alone.

For some time, FCAS appeared to be primarily an Anglo-French UCAV programme. In 2017, Germany and



Spain asked Airbus to start working on a new fighter proposal using the exact FCAS acronym, primarily intended to replace German and Spanish Eurofighters. This system of systems was to include unmanned adjuncts known variously as Remote Carriers or Loyal Wingmen, networked together within an Air Combat Cloud command and communications network to allow what the French Ministry of Armed Forces later dubbed 'collaborative combat'.

The new programme has had several names and supporting acronyms. Confusingly, the name Future Combat Air System and FCAS has also been used by the UK for its entirely separate air combat system of systems and is still frequently used by Airbus. However, the overall programme is also known as the Next-Generation Weapon System (NGWS), with the manned element known

as the Next-Generation Fighter (NGF). Notionally, at least, the programme has also been known as the Zukünftiges Luftkampfsystem (literally future air combat system) in Germany, the Système de Combat Aérien du Futur (SCAF) in France and as the Futuro Sistema Aéreo de Combate (FSAC) in Spain.

In mid-2017 it was reported that Germany and Spain had partnered to draw up requirements for the New-Generation Weapon System (NGWS), the proposed new air dominance system of systems to be developed under the FCAS effort. Respected defence journalists reported: "France has given no indication that it would be interested in joining this group even at this early stage, to study the requirements for a new fighter jet."

However, the project rapidly became a Franco-German undertaking, although there were distinct differences in the

RIGHT:

Dassault's NGF concept has widely spaced, highly canted tailfins, and arrow wing, and forward-swept intakes like those on the F-35. The aircraft is the smallest and most distinctive of the sixth-generation fighter concepts we have seen so far on

Dassault

BELOW:

This Hensoldt impression of the Airbus NGF concept is a two-seater, with conventional, non-stealth engine nozzles and relatively closely spaced engines, leaving little space for internal weapons bays. The Nose contours leave space for a large AESA radar antenna

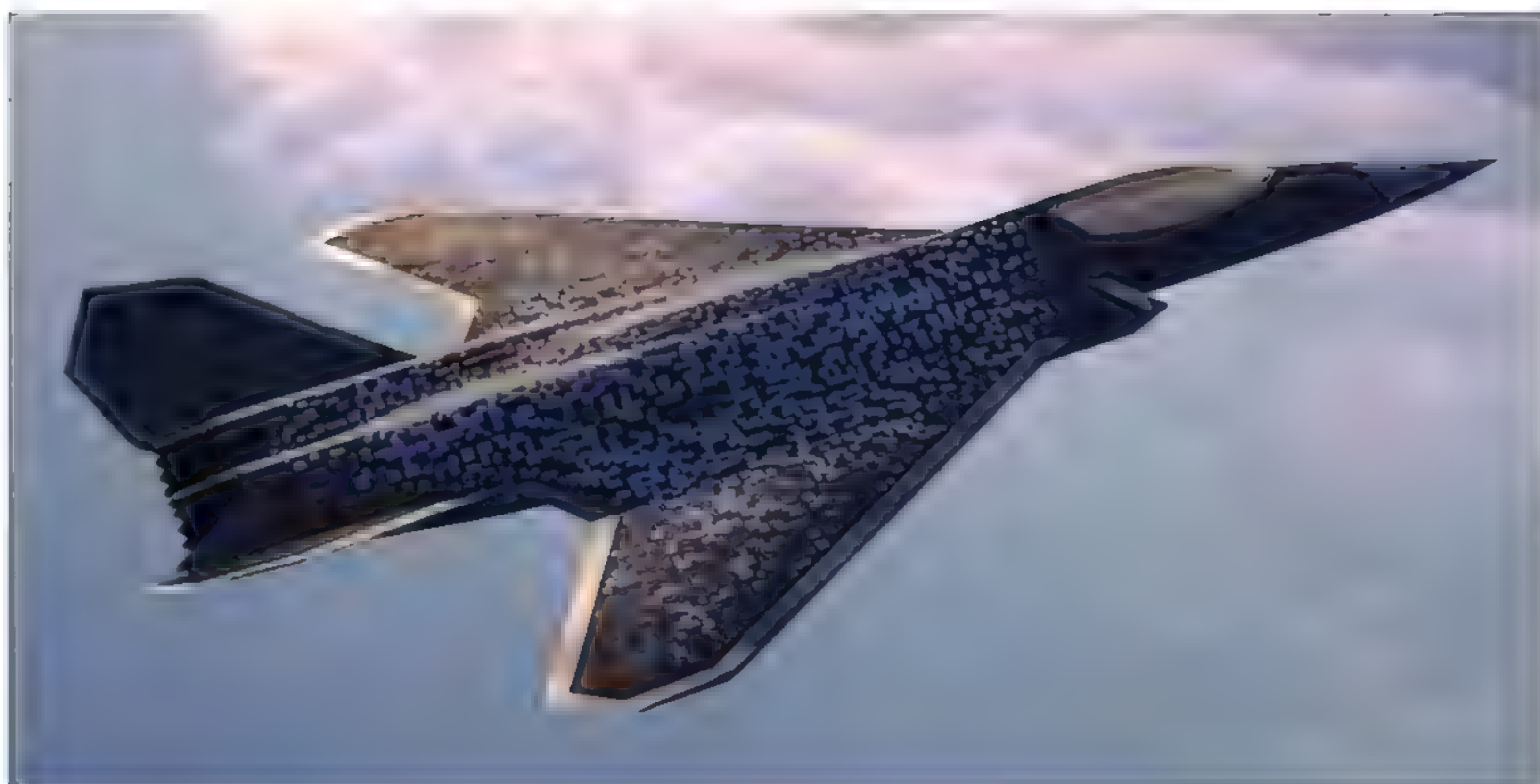
Hensoldt



partners' operational requirements. France prioritised nuclear delivery and long-range strike missions, while Germany had committed to buying the F-35 for these roles.

Airbus and Dassault Aviation signed an agreement to cooperate on the development of the new FCAS at the 2018 ILA Berlin Air Show at Schönefeld. The agreement was signed on April 25, 2018 by Pascale Ehrenfreud, chair of the DLR executive board, boardmember Rolf Henke and Eric Trappier, CEO of Dassault Aviation, in the presence of German Chancellor Angela Merkel and the French Secretary of State to the Minister of the Economy and Finance, Delphine Geny-Stephann.

The agreement between Airbus and Dassault allowed the joint concept study to begin, setting the basic parameters for the system of systems, with a sixth-generation fighter at its heart. The study



was expected to determine significant design elements, including whether the new fighter would be a single- or two-seater. Interestingly, Dassault and Airbus have subsequently shown two quite different concepts, indicating a lack of agreement on a single configuration.

The first images of an NGF came from Airbus and showed a twin-engined cranked delta wing with widely spaced tailfins that seemed to be a two-seater. From the beginning, the NGWS partners saw the NGF-manned platform as a 'command fighter' that would have the ability to control unmanned components and other combat aircraft, performing command-and-control functions. The aircraft will employ artificial intelligence (AI) and data link technologies to allow pilots to perform battle management functions while also acting as traditional fighters and surviving in contested future threat environments.

Dassault then unveiled a small-scale model of its NGF concept at the Euronaval show in October 2018. This aircraft had a stealthy, twin-engined, tailless delta configuration and was described by Eric Trappier as being "more ambitious than the F-35." The Dassault design had changed by June 2019, when a new full-scale mock-up was unveiled at the Paris Air Salon. This had an arrow wing, a butterfly tail and forward-swept intakes and was rather more conservative than the earlier concept.

The defence ministers of France, Germany and Spain signed a framework pact, witnessed by French President Emmanuel Macron. This was followed by a joint industrial proposal formalised by Dirk Hoke, CEO of Airbus Defence & Space, and Eric Trappier. This effectively saw Spain officially joining the programme, with a contract expected by the fourth quarter of 2019.

There was a rather long delay between unveiling the full-scale model and the



RIGHT:
Top Gun was the inspiration for this graphic, illustrating the role of an unmanned Loyal Wingman
 Airbus

OPPOSITE BOTTOM:
When the second Dassault NGF concept was unveiled at the 2019 Paris Air Salon, the full-scale mock-up was displayed next to models of the Airbus recoverable remote carrier, and MBDA's expendable remote carrier
 Dassault



actual signature of the initial framework contract (Phase 1A), which was finally inked on February 12, 2020. The deal was down to a German requirement that any defence-related project costing €25m or more was subject to separate approval by the Budget Committee of the Bundestag. The German share of the Phase 1A demonstrator contract was €77.5m.

The Phase 1A agreement launched the demonstrator phase for the FCAS programme and assigned specific roles and responsibilities to the French and German partners, with the Spanish contribution being left for the Phase 1B contract. The partners said: "This phase will cover the period between 2019 and mid-2021 and will serve as a starting point for demonstrators and technology development for an NGF, remote carriers and an air combat cloud to fly by 2026."

Under the agreement, it was agreed that Dassault would serve as prime contractor for the NGF, with Airbus as its main partner. Airbus was the prime contractor leading the development of accompanying remote carrier vehicles (with MBDA as its leading partner) and responsible for the broader system's supporting combat cloud, with Thales as the main partner. Safran was the prime contractor for the engine, with MTU as the primary partner, while MBDA and Thales were responsible for weapons and sensors, respectively. Work would be spread across France, Germany and Spain. Airbus would conduct work at Manching (the NGF, remote carriers and stealth technologies), Getafe near Madrid (NGF and stealth technologies), Friedrichshafen on Lake Constance (combat cloud and remote carriers) and Elancourt near Paris (overall system of systems and combat cloud).

Prime contractors were notionally

selected on a 'best athlete' basis, though this has proved controversial, with some accusing the French of trying to seize control across all of the pillars. Others hope that the way the programme has been structured may prevent this. Hoke noted that: "The principles of our industrial co-operation include joint decision-making, a clear governance set-up, transparent ways of working and a common preparation and negotiation of this first phase of the demonstrator activities."

After months of negotiations, on Monday, May 17, 2021, the French Minister of Defence, Florence Parly, formally announced that France, Germany and Spain had finalised the Phase 1B demonstrator phase, which was expected to cost €3.5bn, split equally between the three participating nations. This had risen from a previous cost estimate of €2.5bn. Agreement 3, covering programme stages 1B and 2, was estimated to cost more than €4bn for Germany alone, with Germany setting aside €40bn for the whole FCAS programme.

The Phase 1B agreement allowed industry partners to develop a flying demonstrator. However, the timescale for its first flight has slipped to "around 2027" (or "around 2029" according to Eric Trappier), with entry into service scheduled for 2040 or 2042. Then, in July 2022, Trappier admitted "We're not there yet" and said that "with the delays, it's already too late for 2040. We're more likely headed for the 2050s." He subsequently gave a more optimistic estimate of "sometime between 2042 and 2044."

A Phase 2 contract should be awarded in early 2026. It will cover the programme through to the end of the decade, including the first flights of the aircraft demonstrator in 2029 (and of a remote

carrier demonstrator the year before). The third phase should start in 2030.

The NGWS is not simply a manned fighter. The collaborative air warfare doctrine will see the use of unmanned adjuncts known as 'remote carriers' accompanying and supporting the manned aircraft. These will use swarming and teaming tactics alongside AI to create unpredictability for the adversary.

Two classes of remote carriers are being developed. The first consists of relatively large and costly recoverable remote carriers (RRCs), for which Airbus serves as the prime contractor. The second class comprises smaller, cheaper expendable remote carriers (ERCs), for which MBDA is responsible. MBDA is developing an ERC technology demonstrator by 2028-2029 as part of FCAS Phase 2. It is expected to weigh around 400kg and be about four metres long. Operational flight endurance or 'play time' will be about an hour, and the vehicle is expected to have fighter-like performance and manoeuvrability, allowing it to pace itself with the NGF or to serve as a realistic decoy. It will be cheap enough to be used to saturate enemy defences – even future high-end integrated air-defence networks. The ERCs promise to deliver low-cost combat mass while bringing different effects to the battlespace, carrying kinetic effects, electronic warfare, sensors and communications relay payloads. It will be able to be carried in the NGF's internal stores bay or by the larger RRC, as well as from other tactical and transport aircraft, ships, submarines and land vehicles, and will feature a sufficient degree of autonomy to prioritise specific tasks.

Less is known about the larger RRC, but both classes of adjunct/effector will form key elements within the wider FCAS air combat system of systems. Both will

operate within the programme's combat cloud, a mesh-based, multiply redundant and heterogeneous network that avoids critical single points of failure, is resistant to communications jamming and embodies high discretion and dynamic cybersecurity.

Arguments and disagreements

"This is the least harmonious collaborative combat air programme in history," one senior Airbus insider told *Air International*. "We have three national partners bickering over who gets to do what, and two of those partners have taken arguing to the level of an Olympic sport!"

Dassault has resolutely refused to share leadership with Airbus, pushing back against any attempt to infringe on what it sees as its 'territory'. An agreement on the status of so-called specific foreground information (SFI) – those national industrial contributions brought into the FCAS programme at the outset – became a major sticking point as France sought to implement its own intellectual property rights extra protection, making collaborative working more difficult. When the Phase 1B agreement was reached, Trappier explained that: "It entailed putting into place an industrial organisation with a leader and partners. The property of the work to be undertaken will be shared, but the technologies and know-how that belong to us will not be."

France insisted that the demonstrator be built by Dassault in France and that any additional aircraft be identical to the first and, therefore, built in the same way. Dassault's Trappier insisted: "We think that in order to build a demonstrator, the company that designs the aircraft is also the one that should design the flight controls. And that's Dassault."

This provoked a quietly furious response from Michael Schoellhorn, chief executive of Airbus Defence and

Space, who told French business daily *Les Echos* that: "There is indeed a difference of interpretation between us and Dassault on how to carry out real industrial co-operation. Our disagreement relates more particularly to the sharing of tasks on the flight controls and stealth. If the prime contractor Dassault wishes to manage these two key areas of stealth and flight controls without consulting us, then no. Airbus is not Dassault's supplier on this aircraft. We are the main partner."

Schoellhorn said that when Dassault declared itself to be "the 'best athlete' by asserting that we, Airbus, know nothing about the flight controls of fighter aircraft, that is not only untrue but contributes to undermining the spirit of cooperation and mutual respect." Trappier's response was: "We are simply asking the Germans to have confidence in our leadership... Airbus is the strong prime on Eurodrone, and we don't have a problem with that. We simply ask for reciprocity, and the day we have that, there will be no problem."

This may have led to rumours that Germany was considering leaving the FCAS programme and applying to join the Anglo-Italian-Japanese Global Combat Air Programme (GCAP). *The Times* newspaper first reported this, citing "sources close to Germany's Federal Chancellor, Olaf Scholz." *The Times* said that there was a growing apprehension that the FCAS project could become a white elephant and fall behind competing sixth-generation fighter programmes. Scholz was also reported to have been concerned by the supposedly preferential treatment given to French suppliers during the early part of the FCAS programme.

However, the disagreements on NGWS have gone beyond arguing about design leadership. French concern about German arms exports reportedly came close to prompting a French walkout. In 2018, the German magazine *Der Spiegel* reported that France had threatened to

withdraw from the programme because of Berlin's attitudes toward arms exports. Meanwhile, Florence Parly told the French parliament's defence committee: "If we co-operate on the industrial level without having the possibility of selling the equipment to other countries, the economic model for this co-operation will not be viable."

France was also enraged when Belgium and then Germany purchased F-35 Lightnings, calling the decisions "a bad signal for the construction of a European defence" and condemning what it saw as "an American preference prevailing in Europe." French President Emmanuel Macron said that buying the F-35 "strategically goes against European interests. Europe won't be strong unless it is truly sovereign and knows how to protect itself."

There was also some criticism from the other partners when Spain selected Indra, rather than Airbus Spain, as its industrial prime in 2019. They alleged that Indra was a sensor producer that lacked capabilities in aircraft and UAVs. Fernando Abril-Martorell, president of Indra, defended Madrid's selection as being "very logical," explaining that "any other option would have the risk of relegating the Spanish industry to tasks with lower added value." Subsequently, Indra became the lead contractor responsible for sensors alongside Thales and Germany's FCMS.

Most recently, the fact that French government defence spending plans included funding for the development of an unmanned combat air system (UCAS) building on the successful Neuron programme, seemed to directly threaten the Airbus-led RRC with an unwelcome competitor from another company within the FCAS consortium. Eric Trappier said that the new UCAS would not form part of FCAS "for the moment", but this is unlikely to have reassured the Airbus team working on the RRC. **AI**





Electric Beaver

What is the latest from Harbour Air on their ambitious project to electrify the classic de Havilland seaplane?
Mark Broadbent reports



The eBeaver takes off during the Everything Electric festival in Vancouver, British Columbia in September 2024

All images via Harbour Air

Harbour Air, based in Vancouver, British

Columbia, made a splash early in 2019 when it announced a commitment to become the first all-electric commercial airline.

The company unveiled a partnership with Washington-based electric systems developer, magniX, to retrofit one of its De Havilland Canada DHC-2 Beaver seaplanes with an electric engine, as well as a long-term project to electrify its entire fleet of more than 40 Beavers.

Initial steps

A first step towards this goal was achieved on the morning of December 10, 2019, when the initial eBeaver (C-FJOS) fitted with a magniX 500 electric propulsion unit (EPU) flew on the Fraser River in Richmond, BC.

At the time of the first eBeaver flight, Harbour Air said it would begin the certification and approval process with the US Federal Aviation Administration and Transport Canada to prepare the eBeaver for commercial operations. A statement read: "Over the next one to

two years, we will continue testing and alterations on the path to certify the aircraft for passenger flight."

By December 2021, the eBeaver had completed more than 30 test flights, collecting performance data of the magniX 500. The best power settings had been determined and glide performance was next on the testing agenda. In a project update, Harbour Air said: "A lot of what is happening right now is on the regulatory side of the project."

A further milestone was a point-to-point test flight in August 2022. The eBeaver ➡

flew 45 miles from the Fraser River next to Vancouver Airport to Pat Bay adjacent to Victoria International Airport. Kory Paul, Harbour Air's VP of flight operations and one of the company's test pilots, said the flight "went exactly as planned [and] further proved the safety and reliability of what we have built."

'Twists and turns'

Harbour Air issued an update about the eBeaver project in April 2023, in which it said: "There have been many twists and turns" after the point-to-point flight. Over the past few months, certifying the installation of components into an aircraft where no certification path exists has been difficult. Adding to the challenge has been using novel engine and battery technology. Incorporating the elements of software and electronic control systems makes it increasingly difficult.

added that a ground-running certification prototype for the eBeaver's electric propulsion unit would have to be built.

Objectives

Air International asked Harbour Air for the latest on the development and certification process. Erika Holtz, engineering and quality manager at Harbour Air Group, replied: "We are flying our experimental aircraft to continue to gather data to inform the certification process and design. The certification basis is close to being agreed upon with Transport Canada and we are looking to have our certification build completed in 2025. We are targeting 2026 for initial certification and 2027 for the market version of the aircraft."

Holtz said these targets mean the objectives in the coming months and through 2025/26 are "to obtain our Design

four-blade Hartzell propeller. Holtz said: "The original three-blade prop is a much older design and is made of metal where the [four-blade] prop is composite, so is much lighter. The blades are also shorter than the original, and we spin the prop at a slower speed – 1,900rpm instead of 2,300rpm on take-off. This is where the noise reduction happens as most of the noise comes from the tip of the propeller. The shorter the prop blades and the slower they spin, the less noise they produce."

More thrust

The eBeaver's magniX 650 EPU is rated at the same power (650hp) as the original Beaver's Pratt & Whitney R-985 Wasp radial engine, but the new engine actually produces 300lbs more thrust at the same power. Holtz explained: "This is due a combination of many factors, primarily the improved efficiency of the

RIGHT:
Harbour Air intends to complete a certification build on the eBeaver in 2025, ahead of initial certification in 2026

OPPOSITE:
The battery pack will have approximately 160kWh capacity and will be capable of providing 336kW take-off power

"Fundamentally, the technology has been outpacing the regulators. As such, assumptions were made to continue developing which can result in risk of misinterpretations from regulators. One such situation occurred when an assumption was made throughout the industry that an electric engine is equivalent to a reciprocating engine when it comes to system safety analysis and single fault tolerance to a loss of power control (LOPC). We have since learned that the regulators will require a system safety analysis for a single electric engine installation to meet the reliability requirements and that it must be single fault tolerant to an LOPC event. Additionally, the regulators will also be issuing a definition of what LOPC means for an electric engine, as it will be different than that of an internal combustion engine."

The change from the regulators, Harbour Air noted, meant companies working in electric aviation "are revisiting their architecture" to meet the higher reliability requirements. The company

Approval Organization certificate to perform a test campaign on wheels and to work through the means of compliance for certification with Transport Canada."

New prop

The eBeaver produced by Harbour Air looks broadly similar to the in-service examples of the classic, long-serving short take-off and landing utility Beaver, but there are significant technical changes to accommodate the magniX 650 EPU. Holtz explained: "Everything firewall forward is removed and replaced with a new engine mount, electric engine, cooling system and cowl. The fuel tanks are removed and replaced with lithium-ion battery modules. We distribute the modules throughout the fuselage to maintain the original weight and balance envelope of the aircraft. New instrumentation is also added to the dashboard, and the control levers are changed out."

A significant visual difference between the eBeaver and original aircraft is a new

propeller and the reduction in parasitic and cooling drag on the aircraft. The improved thrust shortens the take-off slide when performed at the same power settings and improves the climb gradient. It also allows for a reduction in the power required for level flight, which is used for the cruise phase, and for calculating the reserve

"We did not need to change any of the main structure or control of the aircraft. The baseline aircraft includes the 5,600lb gross weight kit. All flight controls and rigging remain original. The throttle controls are changed slightly as we no longer have a mixture control." A new linkage allows users to reverse the eBeaver and engineers are investigating the possible installation of a ventral fin.

Holtz reported significant improvements in flight performance between the eBeaver and the original aircraft: "We have not yet evaluated handling characteristics at the edges of the envelope. That is something we will look into next year."



“Everything firewall forward is removed and replaced with a new engine mount, electric engine, cooling system and cowling”

Erika Holtz, engineering and quality manager, Harbour Air Group





Batteries and charging

Battery performance goes right to the heart of the business case for electric aircraft. Higher-performance battery packs can provide high output or offer a high number of cycles, but heavier packs inevitably impose a weight penalty that restricts payload/range. There is a balance to be struck between battery size, output/cycles and cost.

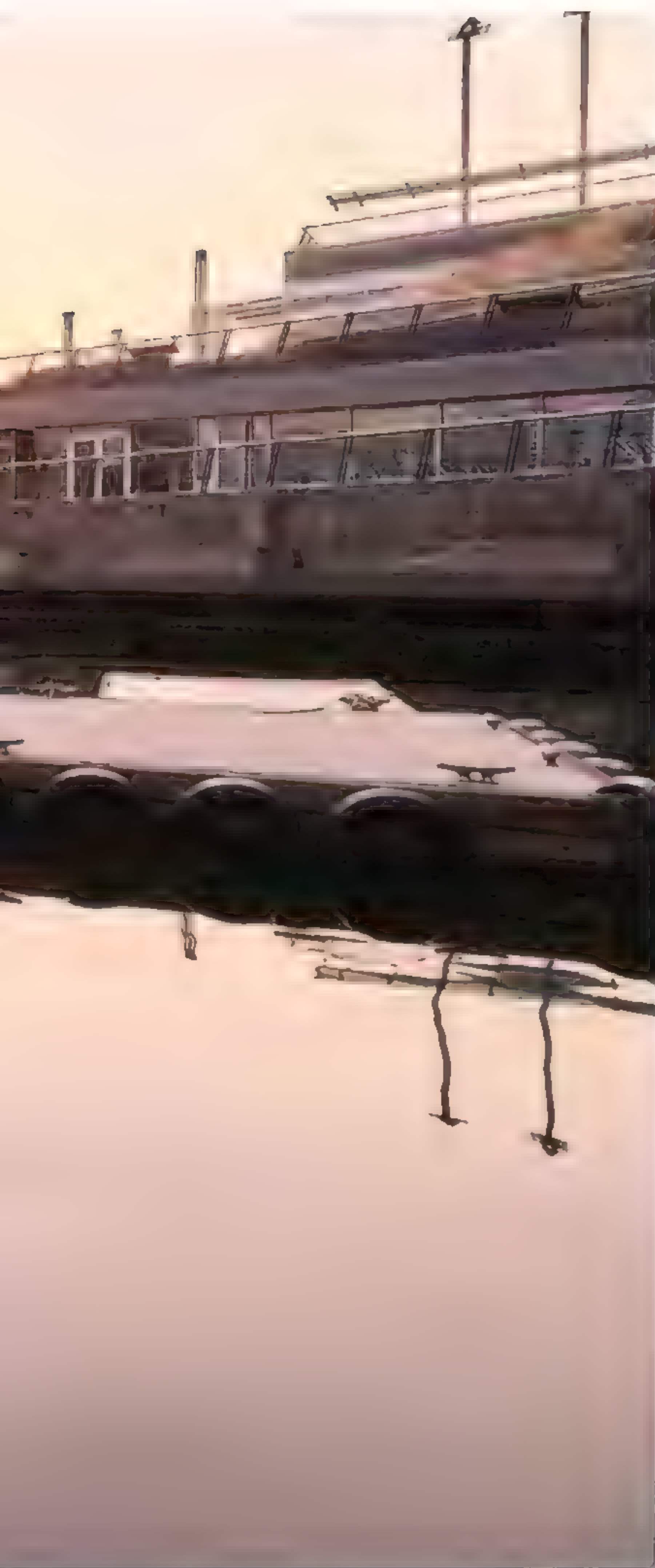
Seaplane operations of the kind Harbour Air undertakes only require short ranges and small aircraft, so large batteries are not required. Holtz said: "The battery pack will have approximately 160kWh capacity and will be capable of providing 336kW take-off power. We are anticipating a 30-minute turnaround time when a 150kW charger is available."

The rate at which batteries for an electric aircraft need replacing when in service is part of the cost-effectiveness of aircraft electrification. On the eBeaver, Holtz said: "The expectation is that battery cells need to be replaced when their state of health is at 80%. Given

the numerous variables involved – for example, how fast you charge them and at what temperature – it is hard to predict how many charging cycles we will have."

Harbour Air will install 150kW charging stations to accommodate the required charging for eBeaver turnarounds. Holtz describes this aspect of the project as "our biggest technical challenge. Our flight network includes locations that don't have access to three-phase power, and most charging stations can't output greater than 750v unless you have three-phase power. We are working with partners to find a solution, which will likely come from the EV [electric vehicles] world."

How will the EPU evolve in the next few years as aircraft development continues? "I do not anticipate many changes for the electric engine. However, I do expect there to continue to be fairly rapid developments on the battery technology so that we can get longer range and higher payload. This will also lead to development of larger fully electric aircraft in the nine-seat range."



LEFT:

The eBeaver has an entirely new engine, mount, cooling system, cowling and four-blade Hartzell composite propeller

BOTTOM:

Harbour Air intends to electrify its entire fleet of DHC-2 Beavers to operate its seaplane flights

BELOW:

The eBeaver's magniX 650 engine has the same 650hp rating as the original Beaver's Pratt & Whitney R-985 Wasp radial engine, but the new engine produces more thrust



FAR Part 33

As for the regulations covering the the eBeaver, Holtz said: "As per the Federal Aviation Regulations [FAR], the EPU is defined as an aircraft engine and will be certified under FAR Part 33, which is why we keep referring to it as an engine and not a motor. Once the engine has the Type Certificate Data Sheet, we will certify the installation of the engine and the batteries under TCCA CAR 523 change 18, the performance-based regulations. There are many unknowns since we are dealing with novel technology. The biggest challenge is trying to help develop the means and methods of compliance while trying to demonstrate compliance to the requirements at the same time."

Despite the challenges involved, Holtz emphasised the ultimate benefits of electrifying the Beaver: "There is a significant improvement in efficiency as well as drag reduction to the airframe, resulting in better take-off, climb and cruise performance. We will completely eliminate greenhouse gas emissions and reduce noise." **AI**



Quietly progressing forward

Electric powerplants have been making inroads into all areas of aviation. **Glenn Sands** spoke with Gabriel Massey, president and CEO of Pipistrel, who explained that the future is electric



The Velis Electro is currently one of the greenest ways of learning to fly
All images via Pipistrel

The global demand for commercial pilots has never been higher, with a predicted shortfall of 34,000 pilots by next year, which by some industry reports may be as high as 50,000 in the most extreme scenario. The impact of furloughs and mandatory retirements is taking a toll, meaning that in the next 20 years in North America, one of the busiest commercial flying regions in the world, there is going to be a need for 130,000 new pilots. By all current estimates, this is unlikely to be met unless fundamental changes are made to the pilot training system globally.


The increasing costs of pilot training is impacting those seeking a seat in the cockpit and the operating costs for

training schools are forcing them to look at alternatives to traditional methods, in efforts to be cost effective and adhere to a host of new 'greener' aviation guidelines being introduced within the next few years. One of the leading players in this field is Slovenian-based Pipistrel. Thanks to its use of electric engines, it offers the flight training world the greenest way of learning to fly.

Gabriel Massey, president and CEO of Pipistrel, told *Air International* why electric aviation has dominated the company's development: "We've long been at the forefront of alternative propulsion and committed to positively impacting the future of aviation through innovative solutions. Electric aviation and battery technology is the way forward. The technology has seen a significant increase in capability, particularly in

the last few years. The success of this technology in the automobile market means there's a growing anticipation for similar achievement in aviation."

Massey foresees a rise in electric flight training across the wider general aviation sector, which he believes offers a more accessible and eco-friendly option for pilots and operators. With this in mind, the company is actively focusing on advancing battery technology to offer increased flight duration, which has been a request from countless flight schools: "As battery density improves, we can expect to see increased endurance, making electric aircraft an attractive choice for a wider range of missions."

According to Massey, electric aviation is one of the sectors where significant growth is anticipated, and Pipistrel is one of 

CLOCKWISE FROM OPPOSITE BOTTOM:
The Pipistrel Taurus Electro is a ground-breaking two-seat, side-by-side, self-launching glider. The glider can operate from shorter runways and climbs faster thanks to its 40kW electric powerplant

The Nuuva V300 is a revolutionary design for long logistics operations and cargo delivery

The Velis Electro is the first ever type-certified, electric-powered aircraft, fully approved for pilot training in Day VFR operations



those driving the current innovations in the marketplace: “We’re committed to driving innovation in more sustainable aviation and creating new opportunities for the next generation of pilots. It’s where we see the most immediate impact of sustainable aircraft initially taking place – in the flight training market.

“Our all-electric Velis Electro is an unparalleled choice for flight schools, offering a quiet, 60 decibels in noise, high-performance aircraft with intuitive handling and a user-friendly cockpit. Developed over 12 years, the Velis Electro offers a flight duration of 50 minutes, making it an ideal choice for trainee pilots.”

In addition to its performance and

handling, the Velis Electro offers significant cost-saving benefits due to its electric powerplant, operating at less than half the cost of a traditional combustion engine trainer. This reduces operating costs for flight schools and lowers the financial barrier for individuals seeking a pilot certification. Making flight training more accessible and affordable, Massey believes, can go some way towards filling that much-needed commercial pilot demand in the future.

Despite the potential benefits offered by electric flight, there is still some reluctance to introduce the technology within certain sectors, with critics arguing that it needs to ‘mature more’. Massey claimed this

didn’t affect Pipistrel technology: “What sets Pipistrel’s technology apart is our holistic approach to electric propulsion. For example, the Velis Electro is powered by an in-house, type-certified electric engine, the E-811, which produces 57.6kW from a 345VDC electric system. Our dual battery system and liquid-cooled powertrain ensure safe, reliable, all-weather operations with a lifespan that matches or exceeds conventional aircraft. The system takes battery health and charge state into consideration to present the pilot with an accurate display of remaining endurance and power. Liquid cooling is a game-changer, enabling operations at low sub-freezing



temperatures, which is crucial for year-round functionality in diverse climates."

Training schools making the switch

With several training schools across Europe keen to embrace the 'electric experience', *Air International* asked Massey what the feedback has been from those that have already made the switch: "The flying schools that are using the Velis Electro have been very positive about the aircraft. Owners have consistently highlighted two key aspects: technological innovation and cost-efficiency. They appreciate the zero-emission, low-noise pollution of the aircraft. It's allowing them to bring flight training closer to urban areas without disturbing the local communities, as in the past. Additionally, they have praised the Velo Elctro's instant power delivery and simplified user interface. Instructors have noted that the intuitive cockpit layout makes the aircraft incredibly user-friendly for student pilots, saying it simplifies handling so that trainees can focus more on learning fundamental flying skills."

Overall, flying schools have seen significant cost savings due to the reduced maintenance and lower operational expenses compared to traditional aircraft, although Massey acknowledges that "the current one-hour endurance of the Velis Electro may not accommodate a school's entire curriculum or present operational challenges depending on the airport and airspace."

The development of battery technology is a cornerstone of Pipistrel's strategy. Incremental upgrades are on the horizon, which will benefit customers and aircraft systems.

Why now?

Why is this the right time to move to electric aviation? It's been a common question across all sectors of the industry

"What sets Pipistrel's technology apart is our holistic approach to electric propulsion"

Gabriel Massey,
president and CEO, Pipistrel

for a number of years as the technology is finally becoming a daily practical option. Massey said: "Now is the ideal time to shift for several key reasons. Technology is mature and advancing rapidly, with significant advancements in battery performance. Additionally, regulatory bodies are establishing frameworks to support and certify emerging technologies – enabling broader adoption and integration."

With such a positive outlook on the technology, Massey gave an insight into what's ahead for Pipistrel: "We have a number of active development programmes in general aviation and advanced air mobility, including the Nuuva V300, which is a hybrid eVTOL automated point-to-point logistics platform. The long-range, large-capacity UAS can carry a 600lb payload up to 300nm and can operate from paved, uneven surfaces, making it ideal for less developed infrastructures."

Pipistrel's first Nuuva 300 is currently in development, with the first flight due in the



next few months: "If fully BVLOS (beyond visual line of sight), the aircraft is equipped with a triple-redundant flight control system, remotely surveyed by the operator at a ground control station. The aircraft maintains connectivity through satellite-based systems, allowing the operator to monitor its progress anywhere in the world. The Nuuva 300 will have a zero-emission electric vertical take-off powertrain capability, with a separate dedicated cruise propulsion system utilising traditional automotive fuel to provide the operator with the ultimate flexibility due to its runway independence. The aircraft will be simple to operate across a number of commercial uses, including humanitarian aid and logistics. There are also defence applications for logistical supply."

For a company that began its research into electric aviation in 2000 and developed its first electric propulsion in 2004, Pipistrel has come a long way. It shows no signs of giving up its spot with its electric-leading technology. **AI**



Thaw & Order

Whenever there's snowfall or ice on aircraft, airlines and airports begin de-icing procedures as part of their safety protocol. Aircraft cannot safely operate if snow or ice accumulates on the wings or tails, so removing it before take-off is critical.

Alex Preston looks behind the art of de-icing







ABOVE:

A portion of the Common Research Model (CRM) wing installed in the Icing Research Tunnel at NASA Glenn Research Center
NASA

OPPOSITE:

The De-Ice system uses gallium nitride (GaN) to generate high-frequency current, causing electrons on the plane's surface to jiggle and generate heat. This melts snow and ice during the boarding process. In 2023, Air Canada installed the systems on an Airbus A320-series aircraft, becoming the launch customer
De-Ice

PREVIOUS PAGES:

Aircraft must be completely clear of ice or snow to maintain the aerodynamic integrity and be safe for flight
Vestergaard Company

The US Environmental Protection Agency (EPA) classifies de-icing as “mean procedures and practices to remove or prevent any accumulation of snow or ice on (1) An aircraft; or (2) Airfield pavement.”

Such a succinct definition fails to convey the complexities and nuances of a process that is vital to the safe operation of flights in wintry conditions and one of all airliners must be aware of.

Critical surfaces of the aircraft must remain clean during take-off to maintain optimal performance. According to a Finnair spokesperson, de-icing is required if aircraft surfaces are contaminated by snow, ice, or frost. They explain that de-icing is usually needed in weather conditions where humidity is high, it is snowing or raining, and the temperature is below freezing or zero degrees. However, dry, frosty weather does not necessarily require de-icing. Other factors, like low wing temperatures after landing, may also require de-icing. The airline says the most challenging condition is freezing rain, as ice quickly forms on the aircraft's

wings. In this situation, categorised as airframe icing, supercooled liquid water impinges on the aircraft and freezes instantaneously. Ice build-up on the forward edges of wings and tails causes significant decreases in lift and rapid increases in drag.

There are several types of structural icing, with three posing the greatest threats,

Under the World Meteorological Society (WMO) definition, Clear Ice (also known as glaze ice) is a clear, tough, dense, heavy, smooth adhesive with little effect on airflow. It occurs usually at warmer temperatures ($> -10^{\circ}\text{C}$) and/or high liquid water contents as then, during the freezing process, an ice/water mixture is formed, which remains semi-liquid for several seconds. Due to the relatively warm temperatures, the released heat needs to be carried away longer by the ambient airflow.

Rime ice is white, porous, opaque, brittle and rough. It is disruptive to airflow and occurs at low temperatures ($< -10^{\circ}\text{C}$) and/or low liquid water contents, as under those circumstances, the released heat during the freezing process can be transported immediately to the environment.

De-Ice System Enclosure

Inverter boards convert the input current into high-frequency signals that leave via the output connector

Output Connector

Control input conveys information to and from control system



Gallium nitride transistors are used to generate high-frequency current that enables De-Ice's proprietary method of heating the aircraft

Airflow outlet expels warm air to control the temperature within the enclosure

Input Connector

De-Ice Heating Strips

For illustration purposes only



"Every few years there is a very cold winter when, of course, the demand for de/anti-icing significantly increases"

Simon Miles, managing director, Miles Aviation Consultancy

Finally, mixed ice is an impingement of supercooled water and ice.

According to the WMO description, small supercooled cloud droplets freeze rapidly on contact with the aircraft, trapping the ice and depositing a white rime on forward-facing surfaces. Larger droplets take longer to freeze, spreading out across the airframe before solidifying.

The intensity of icing can be described as light, moderate and severe as below:

Light: Significant accumulations for prolonged flight (over one hour)

Moderate: Significant accumulations for shorter periods of flight. De-icing/anti-icing equipment must be used.

Severe: Rapid, dangerous accumulations

While structural icing is common, aircraft can also suffer from engine or piston icing. This occurs under conditions of high relative humidity close to freezing when the pressure in a piston causes the humidity to condense and freeze within the engine.

The dangers of encountering supercooled large droplet (SLD) icing conditions inflight can be catastrophic.

On October 31, 1994, an ATR 72-212 airplane operated as American Eagle flight 4184, entered an uncommanded roll excursion and rapid descent and crashed in Roselawn, Indiana. The two flight crew members, two flight attendants, and 64 passengers sustained fatal injuries, and the airplane was destroyed by impact forces.

The US National Transportation Safety Board (NTSB), an independent US government investigative agency responsible for civil transportation accident investigation, which includes aviation, investigated the incident and found that the airplane, while in a holding pattern, "intermittently encountered supercooled cloud and drizzle/rain drops [SLD], the size and water content of which exceeded those described in the icing certification envelope." While the airplane was in the holding pattern, a ridge of ice accreted beyond the airplane's de-ice boots, causing "a sudden and unexpected aileron hinge moment reversal".

Due to Finnair's geographic location, the de-icing season is exceptionally long. The season at its home hub, Helsinki

Airport, lasts nine months, from early September to the end of May. However, de-icing preparedness is available for an extended period – from early August, when nights get colder, to June.

"Despite the challenging winter conditions in the north, Finnair remains one of Europe's most punctual airlines. This is proof of our operational efficiency and the extensive know-how we have in winter operations," the airline tells *Air International*.

A spokesperson reveals that to secure smooth operations during the winter, the airline needs extensive storage facilities for de-icing fluids, suitable equipment, and well-trained staff. "In summer, the de-icing equipment gets checked and thoroughly maintained. This includes trucks and, for example, de-icing fluid tanks. Late summer is also the time for additional training for de-icing specialists, they explain, adding that: "We prepare for the season with our ground service providers and the airport operator. Our ground service providers have extensive experience in de-icing and other ground handling activities."

Airpro supports Finnair's de-icing



operations. The pair are halfway through a new two-year partnership for de-icing services at Helsinki Airport.

"Using external service providers rather than our staff has been a well-functioning and efficient way to conduct all ground handling activities, including de-icing," Finnair says.

In contrast, American Airlines has its own team of de-icing operatives. Chicago O'Hare International Airport (ORD) is the airline's most significant de-icing location and one of the busiest de-icing operations in the world, de-icing upwards of 10,000 flights in one season (depending on the severity of the winter).

For Gene Herrick, American's Manager of De-icing at Chicago O'Hare International Airport, de-icing is an art but also a science.

Herrick explains that "depending on the location, each aircraft will be sprayed with fluid at its gate or at a centralised de-icing pad after departing the gate. American team members or other airport workers then treat the aircraft with de-icing or anti-icing fluid that helps it power through the cold temperatures."

In addition to de-icing American aircraft, the de-icing team at Chicago O'Hare also lend a hand to its oneworld Alliance partners by providing de-icing services for their aircraft.

Helsinki airport has two de-icing areas located near the runways. Explaining the process, a Finnair spokesperson says that aircraft will taxi from the departure gates to the de-icing area in a co-ordinated manner so they don't form a queue. From the de-icing area, aircraft proceed directly to the runway. Depending on the runway combination in use, one de-icing area is used at a time. De-icing is usually performed using four closed-basket de-icing trucks at one de-icing pad for one aircraft. "Depending on needs, one de-icing treatment can last only a couple of minutes [especially in early autumn]. On a snowy day, the two-stage de-icing of a wide-body aircraft takes about ten to 30 minutes."

The de-icing area can fit five aircraft, with four de-icing trucks working around each aircraft simultaneously.

Herrick says American teams work to free aircraft of snow, ice, or frost in an average of nine minutes. For this de-icing season at Chicago, Herrick's team can de-ice eight narrowbody aircraft at once, doubling the capacity of the central de-icing facility from last year.

De-icing times are defined and vary based on aircraft type. Different aircraft types have unique no-spray areas, and depending on the aircraft, areas requiring de-icing treatment can be hundreds of square metres. Also, the prevailing weather conditions affect the duration needed for de-icing. The de-icing is planned into the flight schedules during the winter season.

Alaska Airlines has a full fleet of trucks, equipment, and personnel across its stations ready to do jump into action, along with a well-stocked amount of de-icing solution. "They work as quickly as the airport and weather conditions will safely allow," the airline promotes. "However, de-icing aircraft at the gate can lead to longer wait times on the tarmac – but safety comes first."

Seattle is Alaska's hometown and the largest operator of Seattle-Tacoma International Airport (SEA) compared to other airlines. "For context, SEA has a very small footprint by acreage compared to other metropolitan airports. This constrains our ability to de-ice our entire schedule of flights in wintry weather. Because the space doesn't allow for that type of volume, we have to thin out our schedule to keep planes moving."

Finnair clarifies that aircraft wings and tail stabilisers are cleaned of snow, ice, and frost before departure. The treatment is enhanced with a protective chemical that prevents ice from forming on the aircraft's surface if necessary.

Two types of fluids are part of the process: the bright orange de-icing fluid is used when frost, snow or ice is already present on the aircraft. It is heated to 140°F (60°C). The anti-ice chemical is green and can be applied after de-icing if extra protection is required. This is typical in rainy weather – it keeps ice from penetrating and adhering to critical and lifting surfaces, such as the wings.

There are four standard aircraft de-icing and anti-icing fluid types: Type I, II, III, and IV.

Type I fluids are the thinnest; they can be used on any aircraft as they shear/blow off even at low speeds. They also have the shortest hold-over times (HOT) or estimated protection times in active frost or freezing precipitation.

Type II and IV fluids add thickening agents to increase viscosity. The thickeners allow fluid to remain on the aircraft for longer to absorb and melt the frost or freezing precipitation. This translates to longer HOT, which means a higher speed is required to shear off the fluid.

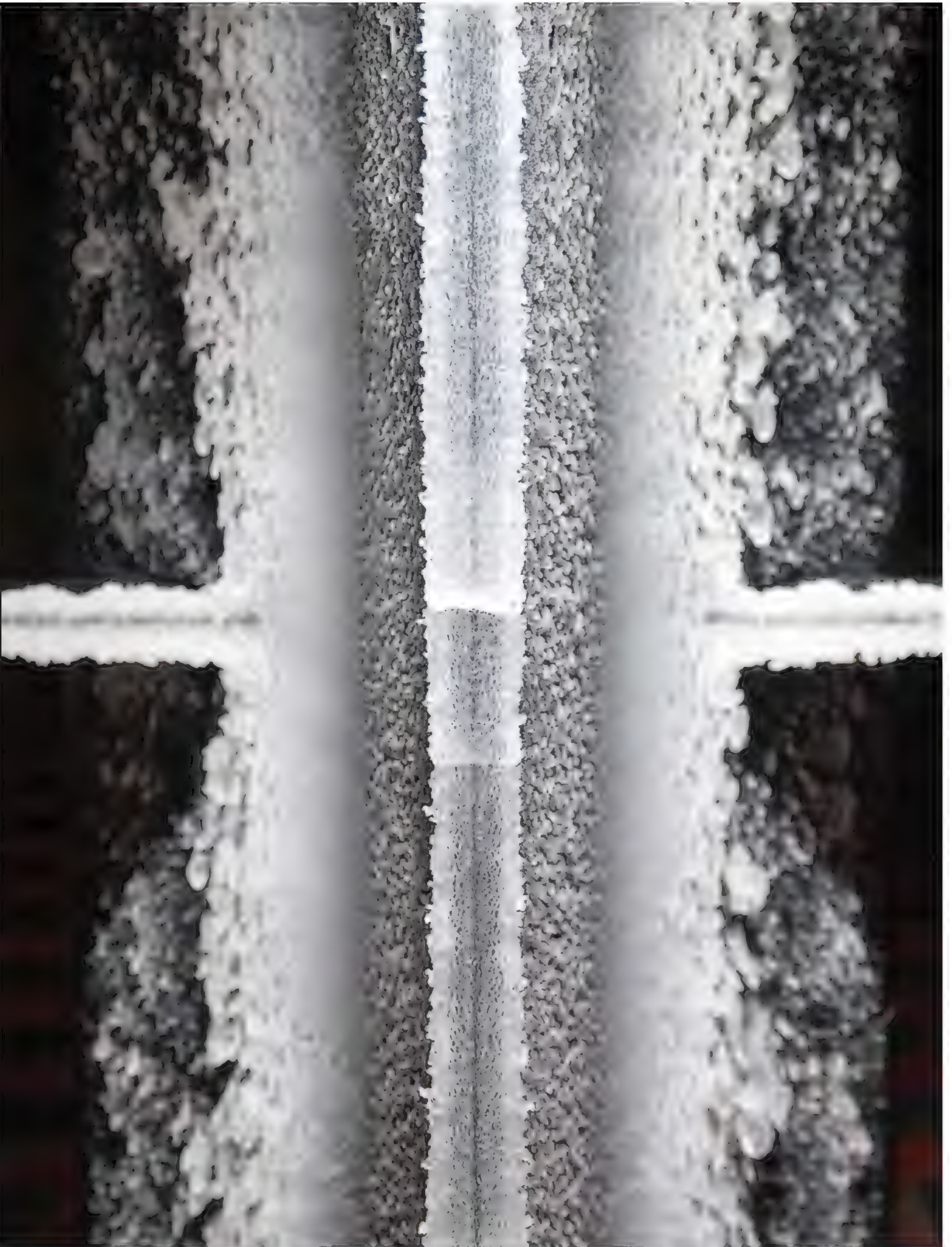
Type III fluids are relatively new and have properties different from those of Type I and Type II/IV fluids. They also contain thickening agents and offer longer HOTs than Type I but they are formulated to shear off at lower speeds. They are designed specifically for small commuter-type aircraft but also work well for larger aircraft.

De-icing is not carried out in very cold weather since the lowest operating temperature of propylene-based de-icing fluid is -33°C.

According to Herrick, it can take anywhere from 60 to a few hundred gallons of de-icing fluid per aircraft,

OPPOSITE:
Ice built up on a test article at NASA's Icing Research Tunnel as researchers study the icing physics that occur when aircraft fly through freezing weather conditions

NASA/GRC/Jordan Salkin





At Helsinki Airport, almost all deicing takes place in two areas called remote deicing areas, with Vestergaard Elephant aircraft deicers
 Vestergaard Company

depending on how much snow or ice has accumulated.

Miles Aviation Consultancy is a UK-based independent consultancy specialising in ground handling and ground operations. Its services include training, auditing, and technical documentation, which it provides globally to the commercial, business, and military aviation industries.

Managing Director Simon Miles says the firm works with various ground handlers and airlines across the UK, Europe, and North America, providing mandatory (and non-mandatory) training, audit, and documentation services. "In

the past, we have also delivered training in locations such as Uzbekistan and Afghanistan," he says.

Miles comments that although the world seems to be experiencing warmer winters on the whole, "every few years there is a very cold winter when, of course, the demand for de/anti-icing significantly increases".

There is a caveat, however. "The price of modern propylene glycol (MPG), the raw material for de-icing and anti-icing fluid, can fluctuate, leading to cost uncertainty," Miles states. "Regardless of whether the winter is mild or severe, the requirements, preparations, training,



and associated costs generally remain consistent for everyone, whether the service is used frequently or not. Providers can only recoup their costs when the service is utilised. Many smaller airports and providers often operate at a loss, but airlines would hesitate to operate certain routes during the winter season without this service."

The company provides unbiased advice to clients relating to their needs and guides them to the most appropriate solutions for their specific type of operation. "Through proper training we create an awareness of the environmental

impact of fluids, appropriate fluid concentration, discourage over spraying and unnecessary use of fluids and encourage fluid recovery," Miles says.

The importance of training and completing the correct de-icing procedures cannot be overstated. In March 2021, a Frontier Airlines plane narrowly avoided a possible incident due to an incomplete de-icing procedure at Nashville International Airport.

The aircraft had requested and received Type I and Type IV de-icing from its de-icing service provider (DSP), who confirmed to the flight deck crew

that the aircraft was de-iced and clear of contaminants. However, upon reaching the runway, and preparing for departure, an alarmed flight attendant called the flight deck stating that the wings were covered with snow and ice still. The flight crew visually inspected and returned to the gate. Both wings had a covering of approximately a foot of snow and ice still with some fluid sprayed throughout the wing area. It subsequently came to light the vendor was running low on fluid.

In response, the DSP acknowledged that "There was a breakdown in Nashville's detailed and vigorous



RIGHT:
In northern Europe, the deicing season typically lasts between October and March every year
Vestergaard Company



de-icing process. An aircraft that had remained overnight during the storm was not fully de-iced. Nothing of this sort has happened in the past 50-plus years and we have vigorously attacked the underlying circumstances to prevent anything like this in the future."

"Alongside our training courses for front-line staff, we offer specialised training for auditors, awareness sessions for ramp staff (such as turnaround co-ordinators), and our De-Icing Management training for non-spraying management and supervision staff," says Miles. "This course, the first of its kind when it was introduced, has proven to be very popular, particularly with our airline clients," he adds.

As with other aviation sectors, de-icing is within the sustainability spotlight's crosshairs. "The industry focuses a lot on new technology, including the development of electric vehicles and environmentally friendly fluids. Still a way to go on that but progress is being made," asserts Miles.

For example, Sweden's Vestergaard Company has introduced a fully electric de-icer based on its e-Mini MY Lite de-icer for smaller regional airports. The e-Mini MY Lite services aircraft up to Boeing 757 with a tank capacity of 4,000lit. The first version, based on a Vestergaard 12 T electrical chassis, had diesel heaters. The latest iteration electrically heats the fluid.

The e-Mini MY Lite has a 40 – or 62kwh battery. Depending on the rate of contamination/fluid needs, it can handle eight to 12 de-icings and drive 40 to 75km on a single charge. The unit also comes with an onboard charger for the chassis and a plug-in for the heater.

In Finland, Airpro provides de-icing at Helsinki Airport with eight de-icing cars:

four offered by Finnair and the remaining four Airpro's new cars. The latter are the first electric de-icing cars in the Nordics. These cars are not only emission-free but also help reduce noise pollution.

Finavia's vacuum vehicles and separate drains collect de-icing fluid from the apron area, which is then used at a wastewater treatment plant. The liquid is used as an alternative carbon source that replaces methanol in the denitrification process. At the beginning of 2024, Finavia started using recycled de-icing fluid for the first time at Helsinki Airport. Recycled de-icing fluid is manufactured to be identical to new de-icing fluid and is a more environmentally friendly. Recycled de-icing fluid has also been used at other airports in Sweden, Norway and Denmark.

Finnair says it uses different pre-deicing practices, where contamination is removed without de-icing fluids. "We are also using deicing equipment with new and developed technology to optimise the usage of de-icing fluids. In addition, pilots use an application that allows them to choose suitable de-icing based on weather conditions. This avoids unnecessary use of liquids and, at the same time, saves jet fuel that is consumed during de-icing," a spokesperson explains.

In 2015, Boston, Massachusetts-based De-Ice was spun out of the Massachusetts Institute of Technology (MIT). It has developed a technique that uses high-frequency electric current to de-ice aircraft without using chemical-based fluids.

In a move that could lead to the removal of glycol from the de-icing process, the De-Ice system consists of tape-like strips attached to the exterior

of the aircraft. The strips connect to proprietary electronics inside the aircraft. When activated by the pilot, the De-Ice system, which uses gallium nitride (GaN) as a semiconductor, generates high-frequency current, causing electrons on the aircraft's surface to jiggle, generating heat. This melts snow and ice during the boarding process, leaving the aircraft ice-free and ready for take-off when the aircraft is prepared to pull back from the gate.

It is designed to be integrated with existing airline operations, including installing the device, which can be incorporated into routine maintenance visits.

Air Canada was so impressed with the technology that it began the first-ever installation of De-Ice systems on an Airbus A320-series aircraft in the winter of 2023, with other aircraft planned to follow.

Speaking at the time, Murray Strom, senior VP, Flight Operations and Maintenance at Air Canada, stated: "Not only will De-Ice technology be positive for our customers by reducing delays related to the conventional method of aircraft ice removal, but the environmental benefits of chemical-free de-icing and associated lower fuel consumption are in line with Air Canada's commitment to a net zero emissions goal from all global operations by 2050... We are proud to be the first airline in the world to install this technology, which will be the first major advancement in de-icing technology in decades."

Even before temperatures drop and the first signs of ice or snowflakes appear, an army of trained experts has prepared to ensure that passengers get to their destinations safely and on schedule, whatever the winter throws at them. **AI**

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Eight Questions

All airlines aim to ensure a rapid turnaround at the airport for an aircraft. Time spent on the ground, at the gate, is time the aircraft is not earning for the operator. With the goal of easing and smoothing this transition time, Assaia has introduced several innovations.

Christiaan Hen, CEO of Assaia, explains more

Question 1: *What are the most significant problems causing turnaround delays? Is the airport, its procedures, or ground support companies simply not embracing the new technology available?*

The most significant problems causing turnaround delays include a lack of real-time common situational awareness between ground handling teams, airlines, and airports. This disconnect often leads to inefficient resource allocation, particularly during high-traffic periods when rapid co-ordination is essential to maintain smooth operations. Airports and ground support companies often deal with legacy systems and procedures that were designed for an era of slower communication and less complex logistics, making it difficult to adapt to today's fast-paced requirements.

The success of any system relies on the willingness of both airports and ground handling teams to embrace change, retrain staff, and adapt new systems into their workflows. Without this buy-in, the potential for operational improvements remains untapped. There's often a hesitation to replace legacy systems, especially when those systems, despite their inefficiencies, are still functional.

Additionally, a deeper issue lies in fragmented and siloed processes. The turnaround process involves multiple entities. From baggage handlers and catering teams to maintenance crews

and refuelling personnel, all of whom must co-ordinate seamlessly to meet tight schedules. A delay in one area can cascade through other tasks, compounding the overall time it takes to get the aircraft ready for its next flight.

Our ApronAI solution can streamline this by providing predictive insights and improving real-time decision-making. However, it is important to note that the bottleneck isn't just technology; it's the integration and willingness to adapt new systems into daily operations. By addressing both the technological challenges and the cultural and operational barriers, airports can better leverage tools like ApronAI to achieve quicker turnarounds, fewer delays, and enhanced overall efficiency.

Question 2: *Airports seek to follow the 'green directive' in reducing their carbon footprint and the inevitable environmental impact of a busy aircraft apron. What is Assaia providing airports to help minimise this, and can you provide an example of your work in this area?*

Our EmissionsControl solution plays a pivotal role in helping airports reduce their carbon emissions by detecting when ground power units (GPUs) and auxiliary power units (APUs) are in use contrary to the airports' sustainability policies, leading to significant reductions in emissions and fuel consumption.

Copenhagen Airport is deploying this thermal camera solution to ensure their sustainability metrics are on track. The APU is an additional energy source that is typically used to start one of the primary engines of the aircraft. The use of the APU during ground operations, including the times when the aircraft is parked, is one of the major sources of emissions and noise at the airport.

The airlines normally adhere to the APU regulations at the airport and co-operate with the pilots if they have forgotten to switch off the APU after arrival. At the same time, the airport collects knowledge about where and in which situations the auxiliary engines are used. Knowledge that can be used, for example, to design the airport's stands so that the need to use the auxiliary engine is reduced.

Additionally, Assaia's TurnaroundControl solution helped reduce taxi-in times by 44% at Toronto Pearson International Airport by optimising the use of gates and taxiways. This improvement not only lowered operational costs for airlines by reducing fuel consumption but also significantly decreased greenhouse gas emissions.

The integration of real-time data with predictive insights allows airport operations to be more streamlined, reducing inefficiencies and contributing to green initiatives that are now central to many airport sustainability programs. By ensuring that emissions are reduced during one of the most controllable phases of flight ➡



Question 4: Looking ahead to the next few years, what are airports requesting regarding new resources for the apron and ramp? What's next or needed in this sector?

Capacity, data, and sustainability are key focus areas for airports. Passenger numbers are growing exponentially, yet there are often no or limited opportunities for physical airport expansion. Airports are increasingly seeking solutions that maximise gate capacity to enable more aircraft turns per gate while enhancing operational efficiency, safety, and sustainability.

Airports and airlines want more comprehensive data-driven solutions, like real-time ground operations and predictive analytics monitoring, to optimise operations and enable effective collaboration between all stakeholders – airports, airlines and ground handlers.

With growing pressure to meet environmental targets, airports also need systems that can reduce emissions



while the aircraft is on the ground, Assaia's solution offers the dual benefit of improving airport performance and contributing to the global push for more sustainable aviation.

Question 3: Safety on the aircraft apron is critical. Can you discuss the impact of your SafetyControl system, how it works, and what feedback users like Delta and Seattle-Tacoma International Airport have given on its use?

Assaia's SafetyControl system offers a sophisticated, AI-driven solution to monitor real-time activities on the apron, enhancing safety and minimising risks. By utilising cameras on the apron, the system captures every aspect of apron

operations and automatically identifies potential hazards, including whether a foreign object debris walk has been performed, the stand is clear of any objects, the bridge is fully parked, and employees are wearing high visibility vests. Once detected, the system sends immediate alerts to the ground crew, allowing for quick responses to mitigate risks before they escalate.

The real-time data captured empowers decision-makers with comprehensive insights into apron activities, enabling them to refine safety protocols and respond faster to emergencies. It helps airlines and airports protect their personnel and assets, and maintain punctual and efficient operations.



and improve energy usage on the ramp. Additionally, there is interest in automation, particularly with tasks like ground handling, resource management, and the integration of AI systems to manage apron operations.

Question 5: Can you explain the process of introducing ApronAI to an airport, what training is involved for the staff, and how long the overall procedure takes from the airport manager's first enquiry to Assaia?

It begins with an initial consultation where the specific challenges, operational goals, and unique needs of the airport are discussed. Assaia's team assesses these needs to tailor the solution, determining

how Assaia's solutions can best address the airport's requirements.

Once the scope of the project is clear, calibration of existing cameras on the apron and annotation are undertaken. The system is then integrated with the airport's existing infrastructure, which may involve connecting with ground handling systems, airport operations databases, and airline coordination systems. This step can vary in duration depending on the airport's size and operational complexity.

Assaia works with its customers to redefine workflows for the target user groups. Assaia then provides on-site training sessions for ground handling teams, operational staff, and airport management, focused not only on how to use the solution efficiently but also how to adapt their work processes to be more effective.

After the system goes live, Assaia continues to provide ongoing support to ensure that the airport is making the most of the solution, adjusting configurations, and helping with any troubleshooting

Question 6: You have installed your systems in airports worldwide, from Canada's bitterly cold weather seasons to warmer temperatures in Rome. What have been the biggest challenges with some airports, and how has Assaia overcome these?

There are different setups across different airports, sometimes using on-premise architecture and sometimes using the cloud. There are also different VMS integrations, video cameras, video codecs, and other elements of the entire IT architecture that can differ on a case-by-case basis.

Behavioural change is the second challenge. People have been managing turns for decades without our solution, so we have to win these users over so that they can now do it better. For younger users with less experience, this is easier than for older, more experienced users whose processes are entrenched.

Our success has hinged on the ability to be highly adaptable. Whether dealing with extreme weather in northern

which not only streamlines the overall operational workflow but also contributes significantly to cost savings on fuel and lowers greenhouse gas emissions. Additionally, feedback from airlines like United underscores the value of real-time visibility into apron operations. Utilising our systems led to a marked reduction in delays, creating a safer working environment for ground crews and enabling more reliable flight schedules.

The benefits extend beyond immediate operational gains; the ability to leverage data analytics for real-time insights means that airlines are not just reacting to issues but proactively managing their operations. When advanced technology meets strategic operational planning, the results can redefine industry standards, ensuring a smoother, more efficient journey for airlines and passengers.

At the recent Assaia User Conference, one of the customers summed it up as follows: "Assaia is leading a movement towards the 'perfect turnaround'! More



CLOCKWISE FROM LEFT:
An optimised turnaround can achieve three more turns a day, which helps increase capacity at airports
All images via Assaia

Assaia's integrated systems keeps the ramp safe by detecting dangerous situation in real-time. It combines detection, business logic, and immediate alerts to provide a critical solution for ensuring safety. Its automated detection generates deep analysis data, helping identify the root causes of incidents and improving safety measures and staff training

Assaia's TurnaroundControl utilises Computer Vision event detection technology. Users can select the turnarounds they're responsible for

that may arise. Airports can expect a significant improvement in operational efficiency, safety oversight, and real-time decision-making, contributing to more streamlined ground operations and a better overall passenger experience.

Each customer has a voice in Assaia's product strategy, and Assaia actively seeks feedback to enhance its solutions based on customer input. For example, based on feedback from Alaska Airlines, TurnaroundControl was enhanced to provide zonal managers with side-by-side video tiles and process widgets to monitor all their turns simultaneously. The change resulted in dramatically increased adoption and, for the first time, a measurable reduction in ground delays.

climates or legacy systems in older airports, our approach remains flexible, ensuring our solutions remain effective no matter the environment.

Question 7: Assaia provides systems to countless airliners worldwide – what has been their feedback to you? What have been the long-term achievements since introducing and operating your equipment?

Airlines that have integrated Assaia's report enhanced turnaround times, operational efficiency, and safety standards on the apron.

Toronto Pearson International Airport experienced an impressive 44% decrease in taxi-in durations,

airports and airlines are joining this revolution every day."

Question 8: On a personal level, how do you spend your free time? Any hobbies that you enjoy?

I like to spend time with my family and friends. At the weekends my wife typically gets to sleep in while I take our son shopping. I love to cook, so we often invite friends over the weekend to enjoy a nice evening with good food and wine. I also really like to bike even though recently I have not been able to spend as much time cycling as I would like. Lastly, I love listening to music and enjoy nothing more than a quiet evening on the sofa exploring old and new music. **AI**

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Emirates will be one of the airlines that's likely to shine in 2025, with plans to increase routes with its new A350-900 fleet Airbus



Spaceflight in 2025 looks set to follow the 2020s trend of record-breaking orbital launches and increased developments in lunar, Mars and low-earth orbit exploration NASA

Next Month

Commercial outlook Continued supply chain challenges, digitalisation, and technological change, are all on the commercial aerospace agenda in 2025

Space 2025 Lunar, Mars and low-earth orbit exploration, and exciting new missions – including Artemis II to send astronauts around the Moon

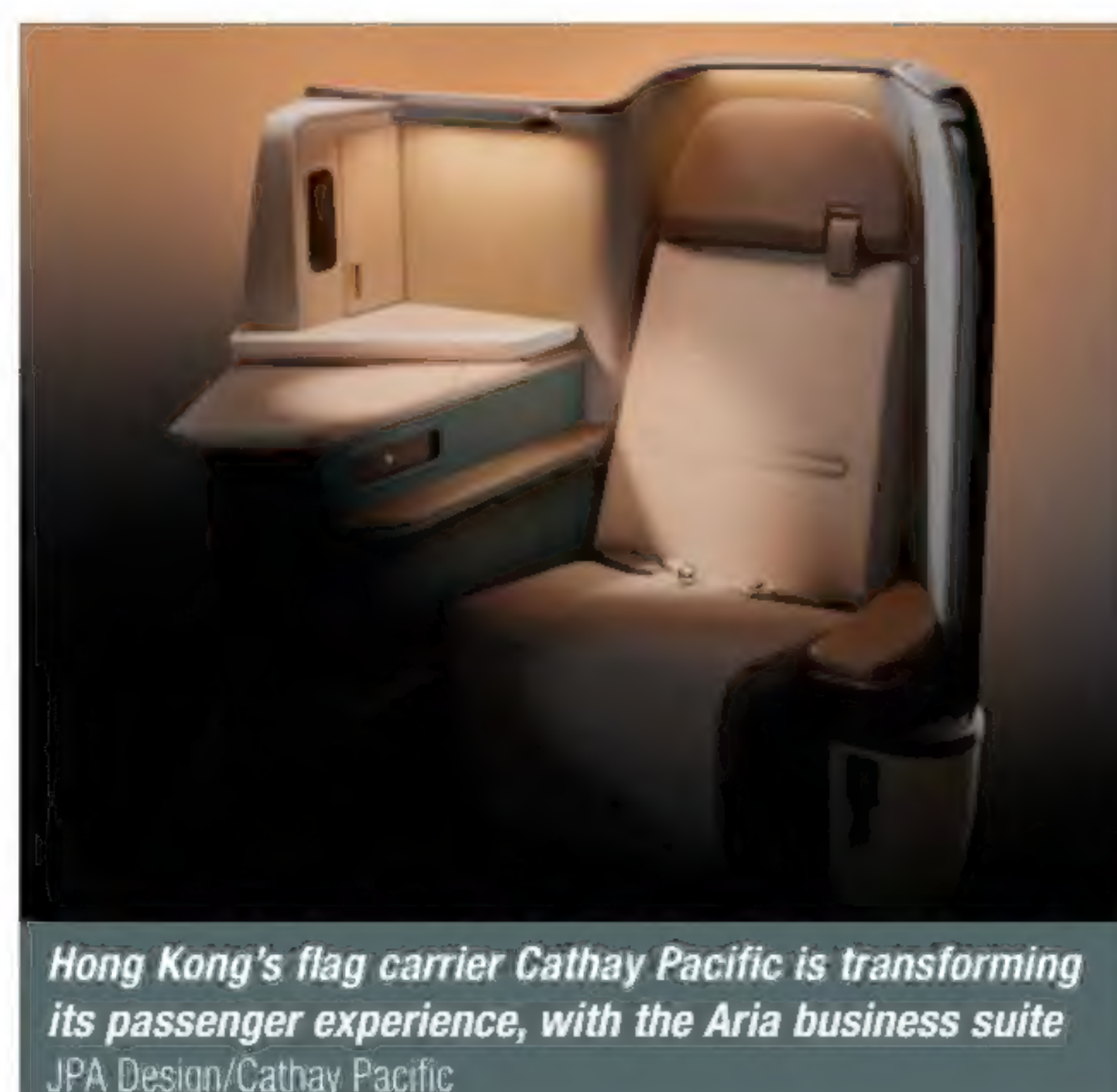
Sixth-generation surplus? Europe has two competing major sixth-generation fighter programmes: the Franco-German-Spanish FCAS/SCAF/NGWS and the Anglo-Italian-Japanese GCAP. Turkey is also developing its own Indigenous Kaan fighter, while Sweden is studying its own advanced next-generation fighter under the KFS (Koncept för Framtida Stridsflyg) project

From sketchbook to the skies

Thanks to JPA Design's artistic vision, Cathay Pacific is reimagining the passenger experience, and it all starts with the refurbished 777-300ER cabins



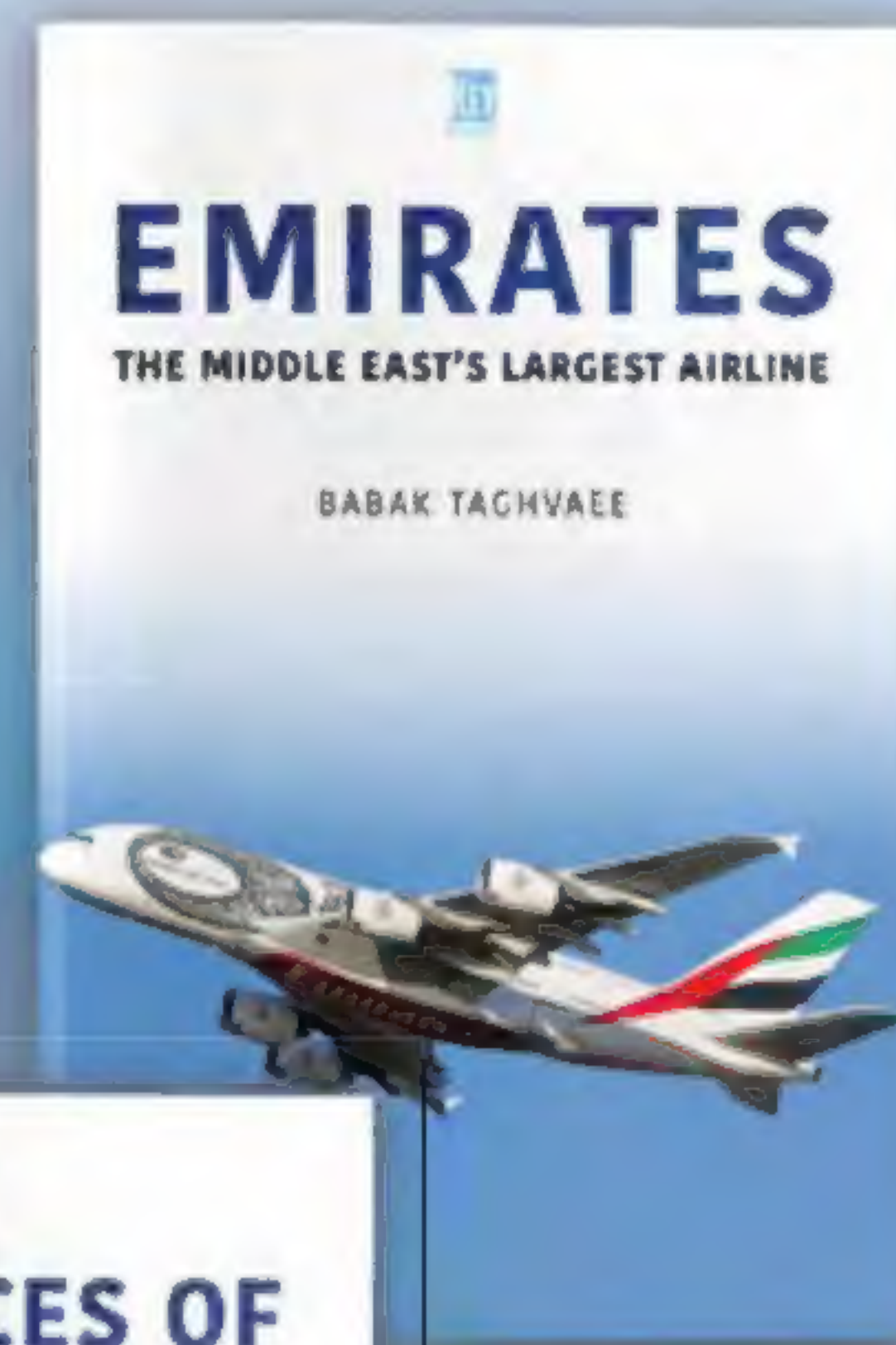
Previously known as the TF-X, and now as the Kaan. Turkey's next-generation fighter may prove a viable sixth-generation alternative TAI



Hong Kong's flag carrier Cathay Pacific is transforming its passenger experience, with the Aria business suite JPA Design/Cathay Pacific

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